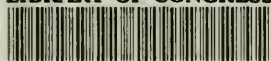


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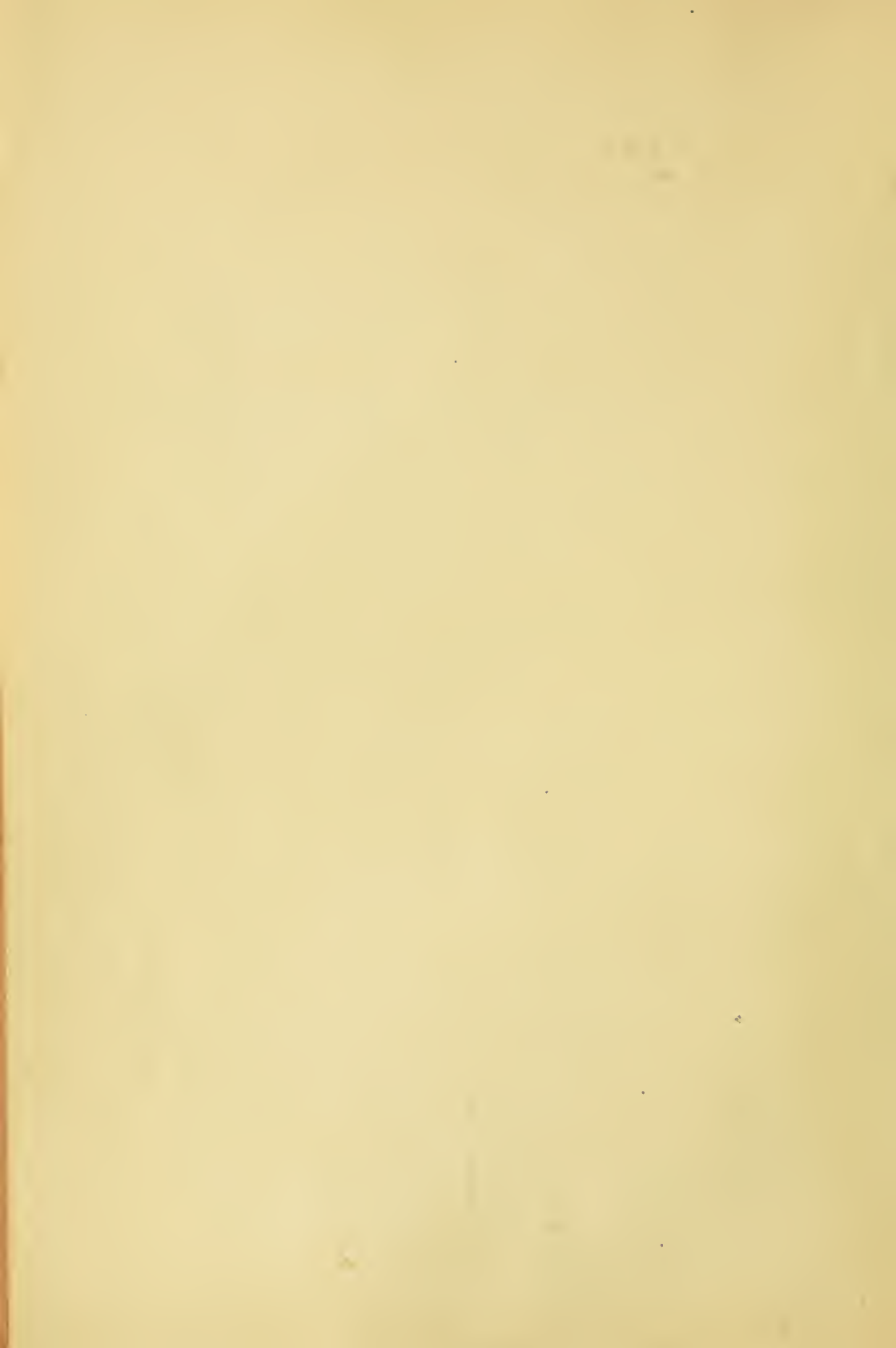
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# AMERICAN RESORTS;

—WITH—

## Notes Upon Their Climate.

✓ BY

BUSHROD W. JAMES, A. M., M. D.,

Member of the American Association for the Advancement of Science;  
The American Public Health Association; The Pennsylvania Historical Society; The Franklin Institute, and The Academy of Natural Sciences, Philadelphia; The Society of Alaskan Natural History and Ethnology, Sitka, Alaska;  
etc., etc., etc.

WITH A TRANSLATION FROM THE GERMAN BY MR. S. KAUFFMANN OF THOSE CHAPTERS OF "DIE KLIMATE DER ERDE," WRITTEN BY DR. A. WOEIKOF, OF ST. PETERSBURG, RUSSIA, THAT RELATE TO NORTH AND SOUTH AMERICA AND THE ISLANDS AND OCEANS CONTIGUOUS THERETO.

*Intended for invalids and those who desire to preserve good health in a suitable climate.*

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## LIST OF AUTHORS CONSULTED.

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The author is indebted for the help he has received from reference to various works bearing upon the subject, as follows:

"Mineral Springs of the United States and Canada," by George E. Walton, M. D.; "Health Resorts at Home and Abroad," by M. Charteris, M. D.; "Wintering Abroad," by Dr. Alfred Drysdale; "Health and Health Resorts," by John Wilson, M. D.; "The Principal Health Resorts of Europe and Africa," by Thomas M. Madden, M. D.; "Appleton's, General Guide to the United States and Canada," "Hand-Book of Summer Resorts," "Hand-Book of Winter Resorts," "Guide to Mexico;" Swinton's "Geography, Physical, Political and Commercial;" "Health Resorts of Colorado Springs and Manitou," by S. Edwin Solly, M. R. C. S.; "Rocky Mountain Health Resorts," by Charles Denison, M. D.; "Facts and Fallacies in Climatology," by H. E. Beebe, M. D.; "Weather," by the Hon. Ralph Abercromby; "The Traveller's Guide," by J. Disturnell; "Compressed Air Below the Sea-Level," by Walter Lindley, M. D.—*Medical Record*, September 1, 1888; "Where Shall We Spend Our Summer?" by Gen. A. W. Greely, *Scribner's Magazine*, April, 1888; "Where Shall We Spend Our Winter?" by Gen. A. W. Greely, *Scribner's Magazine*, November, 1888; "Winter in the Adirondacks," by H. W. Mabie, *Scribner's Magazine*, December, 1888; "The Domain of Climatology and Demography as Dependencies of Medicine," by Albert L. Gihon, M. D.—Transactions of the Ninth International Medical Congress, Vol. V.; "The Meteorological Elements of Climate and Their Effects upon the Human Organism," by George H. Rohé, M. D.—Transactions, Volume V.; "The Importance of the Study of Climatology in Connection with the Science of Medicine," by William Thornton Parker, M. D.—Transactions, Volume V.; "The Preferable Climate for Phthisis," by Charles Denison, M. D.—Transactions, Volume V.; "House Atmospheres or Artificial Climates," by P. H. Bryce, M. D.—Transactions, Volume V.; "Ground Air in its Climatological and Hygienic Relations," by John D. Macdonald, M. D.—Transactions, Volume V.; "Some Remarks on the Climate of the Swiss Alps," by A. T. Wise, M. D.—Transactions, Volume V.; "The Ocean as a Health-Resort," by William S. Wilson, L. R. C. P.





## PREFACE.

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The longer the author is engaged in professional work as a physician, the more he is impressed with the importance of the residence of invalids in a suitable climate as an almost indispensable factor in the treatment, prevention and cure of many forms of disease.

No attempt has been made in this work to describe the trans-Atlantic health stations, as our own country affords sufficient variety and range of climatic conditions to meet the needs of any case where change of climate is desired. It seems scarcely necessary for Americans to seek relief at the resorts of the humid Riviera, such as Nice, Mentone, San Remo, Santa Monica, Cannes, and similar places; or at the more questionable places of health resort, such as Rome, Naples, Algiers, or Palermo, which afford the excitements and unsanitary accompaniments of city life; when in their own land they may enjoy equally good or even superior climates at the health resorts of Florida, Southern California and other places, of kindred clime. Truly, the climate of the health stations located amid the Alpine heights or the fastnesses of the Pyrenees offers many attractions, but that of the resorts in the Colorado Rocky Mountains compares very favorably in every respect. Many of the famous European spas are but prototypes of more or less noted mineral springs in this country, numbered here by hundreds.

If we, as a people, would more generally seek health in our own sanatoria, and our medical men would encourage their patients so to do, the value of these places of retreat for health would soon be appreciated and their fame become widespread. For the American, the health stations in his own land are preferable in that while he is seeking benefit in a change of climate, he is at home among his own countrymen, familiar customs, language and diet, a truly inestimable advantage in many cases of sickness.

This book does not aim at a scientific consideration of the subject of climatology, but has been prepared in the hope that it may be of some practical service to the numerous health seekers in search of information regarding our climate and health resorts.

The author here desires to express his appreciation of the assistance he has received in his work; he extends his sincere thanks to Mary E. Grady, M. D., who has helped in collecting material for the book, and preparing it for the press; to S. Lilienthal, M. D., of San Francisco, and Mr. D. C. Walsh, of the Pennsylvania Railroad, for material for reference; to Mr. Charles R. Deacon, of the American Biographical Publishing Company, who has shown such kindly interest and business energy in the publication of the book; and to Mr. S. Kauffmann, the translator of those chapters of Dr. A. Woeikof's "*Die Klimate der Erde*," that treat of the climates of the western continent. This translation was not an easy task, as the original work was written by Dr Woeikof, of St. Petersburg, in Russian, his native tongue, and translated by him into the German language, consequently the rendering of the English was somewhat difficult and tedious.

THE AUTHOR.

## CHAPTER I.

### MEDICAL CLIMATOLOGY.

Introduction—Definitions of Climate—Elements of Climate—Modifying Influences—Atmospheric Changes—Temperature—Moisture—Sunlight—Rainfall—Air Pressure—Electricity—Soil—Configuration of the Ground—Forests—Latitude—Altitude—Prevailing Winds—Influence of Ocean Currents—Islands—Climate of the Western Continent—Climatic Resources of the United States—Artificial Climate—Climate as a Remedy.

Though home has its endearments a summer or a winter tour has its kindred joys.

In consequence of the improvements in railroad speed and comfort, the American people are rapidly becoming the greatest travellers in the world. They fly over and about their own country from place to place and their families go from resort to resort, and this tide of travel is annually assuming greater proportions. A natural desire for the preservation and restoration of health is the main propelling influence at work as the cause of this general search after a new climate or new scenes, differing in character from those of the usual place of residence.

What, then, we may inquire, is this subtle combination of influences known by the name of climate?

### CLIMATOLOGY.

Montesquieu spoke most truly when he said: "The empire of climate is the most powerful of all empires;" capable, as it is, of making and molding its subjects physically and mentally, of bestowing life or death upon them; the majority of whom have but little knowledge of

the climatic influences of earth, air, and sea by which they are governed. Yet there is nothing mysterious about these telluric, aerial, cosmic and maritime manifestations ; they are simply the result of the workings of certain natural laws which may be, at least in part, known and understood.

Numerous attempts have been made to define the term *climate* satisfactorily, but this is a somewhat difficult undertaking. Walsh defines it as : "The sum total of the extrinsic physical influences amid which we breathe." Bell as : "The sum of the influences exerted upon the atmosphere by temperature, pressure, soil, proximity to the sea, lakes, rivers, plains, forests, mountains, light, ozone, electrical conditions, and doubtless, some other conditions of which we have no knowledge." De Chaumont as : "One of the most complex influences in existence. It is made up of questions of temperature, humidity, pressure, velocity and direction of the wind, nature of the soil, conformation of the surface, presence or absence and kind of vegetation, proximity to the sea or great continents, electrical influences, presence or absence of malaria, and probably scores of other things of an obscure or unknown character. Its variation is practically infinite, and the integration of its many factors well nigh impossible."

From these definitions we gather that the elements of climate are air, temperature, humidity, barometric pressure, light, electricity, soil, and configuration of the ground ; and that the climate of any given place is modified by its latitude, altitude, proximity to or distance from the sea or large bodies of water, length of the day, direction of the prevailing winds, and nature of the vegetation.

The most important element in climate is the air, that circumambient fluid in which we live, and that is subject to

so many variations in its thermometric, hygrometric and barometric conditions. The branch which especially treats of these changes as occurring in a given climate, constitutes what is known as *Meteorology* or the science of weather. Air in its pure state consists of one volume of oxygen and four volumes of nitrogen, but many impurities enter into it, the chief of which are : carbonic acid, the product of combustion ; ammonia and its compounds, the product of organic decomposition ; organic impurities ; dust ; smoke ; and micro-organisms. Another extraneous constituent, a most important one, is moisture.

Sometimes a portion of the oxygen of the air exists in the form of ozone, this occurs where the air is purest, as on the sea, in high altitudes, and pine forests ; its quantity is said to be increased by thunder storms and strong sunlight.

The atmosphere receives its heat from the rays of the sun ; in part by direct radiation, but in a greater degree by reflection and conduction from the earth. This heat is chiefly lost through radiation into space. The effects of atmospheric heat or cold are increased by atmospheric humidity.

When the degree of moisture is calculated as to the number of grains of vapor contained in a cubic foot of air the result is called the absolute humidity, when the amount of moisture is calculated as to the percentage of saturation of the air, it is known as the relative humidity, this depends upon the temperature, for the higher that is the greater the capacity of the air to contain vapor. The lowest possible relative humidity has been estimated to be twenty-five per cent. ; when below fifty five per cent. the atmosphere is said to be very dry ; between that and seventy-five the dryness is moderate ; under eighty-five the air is moderately

damp, and over, extremely so. Rainfall depends not so much upon the humidity of the atmosphere as upon cold currents of air which precipitate the moisture in the form of rain.

The air-pressure at the level of the sea is equivalent to fifteen pounds to the square inch ; this is decreased on ascending above, and increased on descending below, the sea level.

The electricity of the air is positive, while that of the earth is negative ; that of the air is stronger at high altitudes, under a clear sky, and in a cold temperature.

The soil has a marked influence upon the humidity, temperature and purity of the lower strata of air. Clay is the most bibulous form of soil as it absorbs an equal weight of water, sand the driest as it absorbs but about one-third of its weight and soon loses even that. These kinds of soil show the same peculiarities in regard to the absorption and retention of heat. Considerable attention has been devoted to the contamination of the air arising from the earth, this is more marked in some regions than others.

Each external feature of the landscape effects climate more or less. Mountains or hilly ranges act as barriers to currents of air by either arresting or turning them back. Forests have a modifying effect upon the extremes of heat and cold, protecting the earth against the fierce rays of the summer sun, and in winter when the heat from the ground is returned into space, the roof formed by the branches interferes with its escape. Moist or marshy tracts of land act in much the same way, receiving heat more slowly than sandy soil and releasing it with corresponding tenacity.

The climate of a portion of country does not depend alone upon the relative nearness to or distance from pole



or equator, but is modified by several conditions, one of which is altitude. Atmospheric temperature decreases at the rate of one degree for every three hundred feet of perpendicular ascent ; hence, other conditions being equal, a place having an altitude of six thousand feet above the sea would register a temperature twenty degrees lower than that of a place, in the same latitude, at the level of the sea ; while one having an altitude of fifteen thousand feet would have a temperature fifty degrees lower than one at the sea level.

Climate is also modified by nearness to, or remoteness from, the sea or any great body of water. Water absorbs heat to a greater depth and radiates it more slowly than the land ; hence the sea is a great store-house of heat. It tends to produce mildness and equability in the climate of the adjacent land, as in summer its atmosphere is cooler than that of said land because it radiates its heat more slowly, while in winter the sea air is warmer than that of the land for the same reason. Islands have a milder, more equable climate than inland places of a corresponding latitude. The warm currents of the ocean have a wonderfully modifying effect upon the places influenced by them. As a rule the western coast of the continents is warmer than the eastern. At open sea the great extremes of temperature experienced on land are unknown, and though the humidity of the atmosphere is in excess of that on land, it differs in character and its effect upon the human organism from moisture in the air of the land. This difference is probably due to the saline properties of the sea moisture, and also to the fact that the amount of moisture is much less variable than on land.

The length of the day has an effect upon climate. In long summer days more heat is accumulated than is lost

during the following short night; in short winter days an opposite condition obtains.

The prevailing winds of a given locality modify its climate. Currents of air from the equator carry heat with them, while currents from the polar regions are cold. A place on the northern hemisphere exposed to a southerly or equatorial current will have (other conditions being equal) a milder climate than one in the same latitude exposed to the northern or polar currents.

The vegetation of a locality also modifies its climate; an illustration of this is seen in the effect of large pine forests.

#### THE CLIMATE OF THE WESTERN CONTINENT.

American climate presents an infinite variety, as might be supposed, as the western continent extends from seventy-five degrees north latitude to fifty-five degrees south latitude, including the northern frigid and temperate, the tropical and southern temperate, zones.

The northern third of North America is very cold; the southern part of the western coast of Alaska, British Columbia and Washington Territory have a much milder climate than the rest of this region because of the warm Pacific currents and counter trade-winds. The northern temperate region contains the United States, the basin of the St. Lawrence and Great Lakes, as well as the plateau of Mexico. The tropical region includes the lowlands of Mexico, Central America, the West Indies, and the lowlands of the northern three fourths of South America. Within the southern temperate region are included the high tableland of the Andes and the lower fourth of South America.

The climatic resources of the United States are rich and varied, ranging, as this country does, from the arctic regions of Alaska to the semi-tropical climate of Florida



and Southern California, an extent of forty-five degrees of latitude, and from the moisture-laden atmosphere of the ocean and seaboard to the dry, rarefied, bracing air of the elevated plateaus or pinnacled mountain ranges.

From the conformation of the surface, the country is divided into three natural divisions: The Atlantic Highland and Plain, the Central Plain or the Mississippi Valley, and the Pacific Highland.

The climate of the eastern section is varied; the rainfall is abundant, moisture being freely supplied by winds from the Atlantic Ocean, the Gulf of Mexico and the Great Lakes. The winter climate of the northern portion of this section is much more rigorous than that of the corresponding portion of the Pacific coast, because of its exposure to a great cold current proceeding from the Polar seas, loaded with ice, which passes down the Atlantic shores to the west of the Gulf stream. Another factor in the production of this severe climate is the expansion of the continent toward the polar regions whence come the cold northwest currents of air, the prevailing winter winds, and narrowing of the same toward the tropics.

The summer climate of the northern portion of the Mississippi Valley is hot and sultry, the winter cold and stormy; the southern portion has a semi-tropical climate, the winters being mild. Rainfall is plentiful throughout this section, moisture being abundantly supplied by winds from the Gulf of Mexico and the Great Lakes.

The climate of the Pacific Highland is very dry, having but little rain-fall; the Pacific Slope (which includes the State of California and the western portion of Oregon and Washington Territory) has a climate differing from that of any other portion of the United States, having but two seasons: the rainy season (winter) and the dry season (summer).

## ARTIFICIAL CLIMATES.

This term has been applied to the atmosphere of dwellings in which a large proportion of the population of the temperate and colder regions spend more than half their existence. During the winter months they live in this vitiated atmosphere, deriving but little benefit from the climate of the locality in which they reside, no matter how salubrious it may be. This artificial atmosphere generally has too low a relative humidity, being much too dry; a temperature not only too high, but unequal in degree at different levels and portions of the apartment; and a great lack of currents and air movements, which are useful in substituting a fresh supply of air for that already used; in addition to these conditions, is the abnormal state of the air as to its constituents.

It contains a diminished amount of oxygen, and an excess of carbonic acid, from the combustion of gas, fuel, etc.; carbon monoxide from stoves, furnaces and leaks in gas-pipes; ammonia and its compounds, and other gases present where organic decomposition is going on; animal emanations from the digestive, respiratory and cutaneous tracts of living bodies which are probably of the nature of ptomaines; and micro-organisms. These last named exist in greater quantities in dwellings than in the open air. Experiments in Paris, conducted by Miquel, showed the difference between the number of bacteria per cubic metre contained in outdoor and indoor air, as follows:

| OUTER AIR. |     | AIR IN WOMAN'S WARD<br>OF L'HOPITAL DE LA PITIE. |        |
|------------|-----|--|--------|
| Autumn     | 121 |  | 36,700 |
| Winter     | 53  |  | 52,800 |
| Spring     | 70  |  | 32,300 |
| Summer     | 92  |  | 19,300 |

To these artificial climates most of the invalids, women and young children, of the colder sections of country, are doomed for seven months of the year. It is but an added proof of the ability of the human organism to accomodate itself to its environments that so small a proportion of the community perish from these conditions.

#### CLIMATE AS A REMEDY.

Climate viewed from a medical standpoint is a subject with which the practicing physician should be thoroughly conversant, and of which every intelligent person would do well to possess some general information. The physician who studies climatology must be an advocate of the prevention as well as the cure of disease, and taking into account the various forms of sporadic and epidemic maladies, and all the atmospheric conditions general and local, that tend to produce or aggravate these various affections, he should, from his gathered experience, be able to locate his patients, geographically and therapeutically, to their best advantage, so as to prevent the development of threatened diseases and facilitate the cure or alleviation of those already existing.

As a result of the innate desire of man for longevity, the anxiety for continued vigor felt by the healthy, and the eagerness for restoration to health and strength shown by the invalid, climatic agencies have been sought and employed in all ages both as preventatives and curatives. Of late years this field has been more and more scanned, and many localities have proved beneficial in restoring the health and preventing the unbalancing of the vital equilibrium.

The subject of climate and health resorts is one of importance to the public, as hundreds of thousands of the citizens of this great Republic annually seek rest, recreation and healing in a change of climate.

A goodly proportion of these, leave their own land and cross the Atlantic to visit noted European health stations while equally desirable climatic conditions exist in America nearer at home.

For the healthy who reside in cities, even the slight change from the more or less impure atmosphere into a strictly rural one, free from the exhalations arising from a dense population, is in itself a remedy. The diseases to which they are liable simply by residing in a vitiated atmosphere of dust, smoke and deleterious influences which constantly exist in towns and cities, are thus greatly benefitted. This is observed every summer when sick children are taken to the country or sea-shore for restoration. How much better is it then, not only to reside in a rural place but even in an ocean atmosphere or one of a high altitude, where the air exists in a purer form and produces likewise a more stimulating action upon the heart and lungs, this activity improving the circulation and extending in its beneficial effects to the entire human system.

There are localities, usually at considerable altitude, where pulmonary consumption does not originate, or if cases of it be found, they are transported with hereditary tendency or they are only sporadic ones resulting from exposure to changes of the atmosphere. Where the climatic conditions are such as to prevent this disease, it naturally leads one to infer that the same regions will prove beneficial where the inroad of such a malady has manifested itself.

In the following chapters an attempt is made to direct the attention of the reader briefly, to the many desirable places of resort found on this continent, most of them within the limits of the United States.

## CHAPTER II.

### BENEFITS AND DANGERS OF HEALTH RESORTS.

Dependent upon Individual Peculiarities—General Beneficial Conditions—Importance of Residence in a Suitable Climate—Individualization of Climatic Prescriptions—Suitable Surroundings—Congenial Company—Mental Impressions—Advantages of American Health Resorts.

The benefits and dangers of the climate of a health resort cannot be arbitrarily stated, as those climatic conditions which constitute life to one invalid or class of invalids may be inimical to the well-being of another. Truly there are certain conditions equally desirable for all classes of cases, such as purity of the atmosphere and water, hygienic surroundings and other circumstances, but these, as a rule, are matters due to the peculiarities of the special locality, and are not, strictly speaking, of a climatic nature.

Residence in a suitable climate is an almost indispensable factor in the treatment, prevention and cure of many forms of disease. This is evident, for we constantly see invalids about us whose condition is critical, and whose days are numbered if they remain in the climate in which they are living. Many of these persons remove to a climate suitable to their individual case and their malady is cured, or at least so alleviated that life is prolonged for years, and they again become active, useful members of society. In some of these cases this improvement only continues so long as they reside amid these congenial surroundings, for as soon as they return to the unsuitable location they are again reduced to their former sad condition of ill health.



The prescriber of climate must learn to individualize his prescriptions, not alone in regard to the disease, but more particularly in respect to the patient, for every victim of a given disease, such for instance as pulmonary phthisis, will not do equally well in the same climate; hence, in prescribing, the temperament of a patient and the nature and stage of his malady must be considered.

When contemplating a change of residence for an invalid we are, of course, to keep in mind other equally important conditions, such as rest, clothing, cuisine, nursing, sanitary surroundings, congenial company, avoidance of the excitement of fashionable resorts, and many other matters of similar import. There is also to be taken into consideration the various other inconveniences attendant upon travelling, absence from home, business, friends, and the usual physician, also the depressing influence of the presence, at popular health resorts, of numerous invalids. This is particularly unfortunate where many cases of phthisis are stopping in one house, for by constant coughing they will trouble each other day and night.

Great care should be exercised in choosing the resort, in regard to the sanitary surroundings. The place in general may have much to recommend it as to healthfulness, but if the house in which the patient stops has imperfect arrangements in the way of drainage, ventilation, pure water supply, or other hygienic requisites, little will be gained by the change of climate alone.

The same may be said with regard to food; if the patient be unable to secure proper nourishment, as is often the case, he may be but little benefitted by the atmospheric surroundings.

The temperament and circumstances of the invalid should also be taken into consideration in choosing a health resort;

one with quiet tastes will not enjoy a gay place, and *vice versa* ; again if one of moderate circumstances visits a place where the expenses are beyond his means, the worry about pecuniary affairs will probably neutralize the effect of the climate.

It is a matter of great importance for the invalid to seek the benefits of a change of climate at a stage of his malady sufficiently early to be really helpful. Nothing is more pitiful than to see a dying patient, or one near the termination of a fatal disease, or an invalid who cannot be relieved or improved, expend his small store of strength in a fruitless journey and exchange the many comforts of home for the suffering and discomforts that have to be endured by the sick when travelling.

There are, however, many persons affected with chronic incurable diseases, whose sufferings may be alleviated and life prolonged by a residence in a suitable climate, and such should be encouraged to make a change.

We cannot emphasize too strongly the importance of congenial company for the health-seeker. Many invalids when sent away from home, family and friends, suffer so much from homesickness that they are but little benefitted by the change of climate, and are even made worse.

Hence a place of resort should not only possess a climate suitable to the physical needs of the patient, but such conditions, in the way of scenery, amusements, diversions and congenial surroundings, as will act favorably upon his mind ; for who can estimate the effect of mental conditions upon the health of the body ? Probably many times the improvements occurring in an invalid incident to a change of residence, is not so much the result of the influence of the climate of the new place, as of the favorable impression made upon the mind of the sufferer.

The climatic prescription should always be that of a place of resort suitable to the mental condition of the patient. It would not be wise to send a patient suffering from mental depression to a dull, secluded spot, where little could be found to divert his mind from preying upon itself; such a case should rather be advised to visit a cheerful, gay resort, where he will forget his real or imaginary troubles in beholding and participating in the pleasures of life. On the other hand, a person worn out and broken down from a tedious succession of social or business duties will be more apt to find relief in a retreat far from the haunts of fashion or trade, where comparatively alone, he may listen to the secrets that Nature has to tell him; a place where he can settle down quietly and say, "Here may I loaf and invite my soul."

This aspect of the subject widens and grows as it is pursued, until it leads us to that mysterious realm of psychological and spiritual forces, hidden as yet from our view by the shadows of ignorance and prejudice but which must, sooner or later, be revealed as an important factor in the healing of sick bodies and minds diseased.

Residence in a congenial climate is as important a means of preserving health and preventing disease, as it is in the treatment and cure of the developed malady; this is being more and more realized, and we are earnestly looking for the time when the chief occupation of the physician will cease to be that of tinkering diseased and shattered bodies, and his best energies may be devoted to the practice of *preventive medicine* and the *annihilation* of epidemics and other diseases. Surely that will be the "golden age" of the noble calling of the medical profession.

A health resort on this continent has for us several advantages over a distant or trans-Atlantic station. There



the invalid may be among people whose language and customs are not the same as his own ; here he will be saved much inconvenience in case of sudden attacks or a serious aggravation of symptoms, by not being at so great a distance from his family, home and friends.

The climate resources of our own country are so great and varied that we may here not only readily find a suitable resort for every case that a climate change will benefit, but the invalid does not feel so severely the process of becoming acclimated as he does in more distant regions across the sea.

It is observed that in localities where considerable moisture exists and the population is dense, animal food unprotected, will decompose very quickly, while the same kind of nourishment exposed to the atmosphere in a similar manner in some of the drier interior high plateaus does not easily disintegrate but becomes dry, and is preserved for a long period without the least trace of putrification.

In an atmosphere possessing these qualities we almost universally find that pthisis pulmonalis cases, if not in the last stages of the disease, are improved or the malady held in abeyance. Such a climate we regard as a true type of the remedial ones to which we have referred.

It is well known that a low temperature, a few degrees above the freezing point, will preserve many animal and vegetable substances. This fact is taken advantage of by commercial men who preserve meats and fruits in large refrigerating houses as articles for food supply. An even, cool, spring-like climate is also the most healthy.

The applicability of certain special health stations to the various forms of disease will be treated of in detail in the chapter on "Therapeutics."

## CHAPTER III.

### SEA-SIDE RESORTS.

Their Attractions—They Afford a Variety for Either Winter or Summer Residence—Brief References to the Atlantic Sea-Coast resorts—Those on the Gulf of Mexico—Those on the Pacific Coast—Localities on Puget Sound—Places in Alaska.

The sea-side must ever be a favorite place as it offers many attractions to both pleasure seekers and invalids ; the sea draws them with its peculiar charms, seeming in Emerson's beautiful words to say :

“ Is not my voice thy music, morn and eve?  
My breath thy healthful climate in the heats,  
My touch thy antidote, my bay thy bath ? ”

and they to whom a sea voyage is impossible or inconvenient may here enjoy the benefits of sea-air while remaining on *terra firma*. The air at the sea-shore is charged with an increased amount of moisture and ozone ; and with sea salts. These constituents of the atmosphere have a decided effect upon the human organism, and are beneficial to certain classes of cases. This subject is discussed at greater length in the chapter on “Therapeutics.”

In our own country the great extent of sea-coast stretching along both oceans, from the cold north to the sunny south, affords sufficient variety of this kind of climate and outward features of scenery to suit any case to which sea-air is beneficial, and accomodate the most varied tastes. Almost all resorts so located are places of general summer or winter rendezvous, but we will name the principal ones on or near the coasts, and simply state their location,

with the attractions and accommodations they offer to visitors. Those that have any particular adaptability for any special malady will be referred to under climate treatment in the chapter above mentioned. Beginning with our eastern sea-line at its northern boundary, we will follow around, naming the localities on or near the shores, leaving mountain and other regions regardless of State lines, to other chapters.

#### NEW ENGLAND.

The rocky, irregular and picturesque coast of New England, with its adjacent islands, presents many beautiful retreats for those in search of the "healing of the seas." Most of these places have a delightfully cool and salubrious summer climate.

*Eastport.*—At the extreme eastern point of Maine's rugged extensive ocean line, is situated the pretty town of Eastport, with a population of about four thousand, and but a few miles from the Canadian frontier. It is a place well adapted for the residents of Southern cities or those in the belt of summer heat, as a retreat from excessive temperature, and yet one having the advantages of a town residence. Convalescents from low fevers, and cases of neurasthenia and brain-fag, do well here; it is also a good place for simply resting as a preventive measure against becoming sick. Visitors will find large hotels here.

*Mount Desert Island.*—This the largest of the Porcupine group, which is situated in Frenchman's Bay, is one of the many beautiful summering points in Maine and the most popular. It has an area of about one hundred square miles, being fourteen miles long and eight wide; its northern shore approaches the mainland so nearly that it is joined to the latter by a bridge.

The favorite places on the island are *Bar Harbor* on

the eastern, and *South West Harbor* on the southern shore; the former is the more popular and attractive place, but both afford excellent accommodations for visitors.

This island is richly endowed by nature, combining ocean, lake and mountain scenery; its most prominent peak is Green Mountain which attains an altitude of 1527 feet above sea-level, the highest elevation directly on the Atlantic coast-line; its summit is an excellent point from which to view the surrounding hilly country and the out-stretching forests and ocean. About half way of its ascent one comes to Eagle Lake, a beautiful mountain sheet of water in which trout abounds.

Mount Desert has a cool, healthful, summer climate, combining sea and mountain air, which is rendered soothing from the abundant evergreen and piney growth on the island. Bronchial and pulmonary cases generally do well here in the hot season (July and August) notwithstanding the fact that considerable fog hangs over the island or portions of it, at times, especially in summer during the morning and evening. The sun usually appears, however, during the early forenoon of these semi-foggy days.

*Portland.*—Some idea of the charm of much of the scenery along the New England coast may be gained from Whittier's lines on Casco Bay, the inlet upon which Maine's commercial metropolis, Portland, is situated.

"Nowhere fairer, sweeter, rarer,  
Does the golden-locked fruit bearer  
Through his painted woodlands stray,  
Than where hill-side oaks and beeches  
Overlook the long, blue reaches,  
Silver coves and pebbled beaches,  
And green isles of Casco Bay."

This beautiful body of water, which has been compared to the Bay of Naples, is a very fine harbor and contains

several hundred islands, the largest of which is *Cushing's Island*, located three miles from Portland, with which place it is connected by steam ferries. Its area is about two hundred and fifty acres; its beaches are excellent and the facilities for bathing good. It is a place much resorted to by Canadians; there being a good hotel on the island. Several of the other islands in Casco Bay are resorted to and afford good accommodations.

At the southern side of Casco Bay is a point of land known as *Cape Elizabeth*, a pleasant locality with good bathing and fishing. The cape consists of a series of cliffs and ledges and on its point stand the Twin Sisters (lighthouses). This place is very near the city of Portland and has desirable hotels.

*Scarborough Beach*.—This place has ample facilities for bathing, hunting and fishing, and excellent hostleries. It is a few miles from the last-named place and is very popular during the summer months. A short distance down the coast is *Pine Point*, also a pleasant place.

*Old Orchard Beach*.—This is one of the finest beaches on the New England coast; it is crescent-shaped, about ten miles in length, and has fine surf bathing, excellent fishing and driving. Many hotels and boarding-houses affording choice entertainment for families desiring to spend the entire summer, are to be found here. This is one of the most frequented places on this portion of the coast.

*Biddeford*.—It is but four or five miles from Old Orchard to *Biddeford*, which is a flourishing city of 13,000 population, situated near the mouth of the Saco river.

*Saco Pool* is not far from Biddeford; a steamer runs twice daily between these points during the summer months. The pool is a basin hollowed out of solid rock about one quarter of a mile from the ocean, with which it



is connected by an inlet through which it is filled and emptied by the tide. There is a hotel at the pool.

*Kennebunkport*.—A few miles down the coast is the picturesque old town of *Kennebunkport*, situated on the Kennebunk river. This place had a few years since a large ship-building trade, but this industry has nearly ceased since the decline of American shipping.

*Wells Beach*.—Not far distant is *Wells Beach*, six miles in length and a favorite region for sportsmen. Snipe, curlew, partridges and woodcock are found in abundance and a trout stream adds to the attractions of this place, which has several hotels and is about eighty-five miles from Boston. Beyond this point is a long stretch of beach known as *Ogunquit Beach*. It extends nearly the entire distance from *Wells* to *York*.

*York Beach*.—This is a good bathing place and a favorite summer resort. There are some fine cliffs in the vicinity which add to the scenery of this part of the coast.

*Portsmouth*.—About ten miles to the south-west is the old town of *Portsmouth*, located on the Piscataqua river. *New Castle*, a town on an island of the same name, about two miles from Portsmouth, is prettily situated at the mouth of the river and is a popular place. It has one of the finest hotels on the coast. This is a locality of historic interest, being the first settlement of any importance in New Hampshire, and for some time the seat of the provincial government and the centre of trade.

*The Isles of Shoals*.—This is a group of eight rocky, bare islands, which lie at a distance of about fifteen miles directly off the coast from Portsmouth. The *Appledore* is the largest of the group; the first-class hotel of the same name and its cottages are the only residences on the island. On *Star Island*, another of the group, a fine hotel and several

cottages are located, which are equal to those of the Appledore Isle. On *White Island* there is a lighthouse with a powerful revolving light, which is visible fifteen miles distant.

This group has come to have a prominent place in literature, from the writings of Lowell and others. Mrs. Celia Thaxter the poet, many years of whose life have been spent on White and Appledore Islands has sung to their praise ; in her book, "Among the Isles of Shoals," the descriptions of their charms are beautiful ; she says: "Swept by every wind that blows, and beaten by the bitter brine for unknown ages, well may the Isles of Shoals be barren, bleak and bare. At first sight, nothing can be more rough and inhospitable than they appear. \* \* \* \* But to the human creature who has eyes that will see, and ears that will hear, Nature appeals with such a novel charm, that the luxurious beauty of the land is half forgotten before one is aware."

*Rye Beach*.—About seven miles from Portsmouth, is the most noted sea-side resort on the New Hampshire coast, *Rye Beach*. It has good surf bathing and excellent hotels.

*Hampton Beach*.—It is separated from *Hampton Beach* by a prominent headland, the Boar's Head. The bathing, fishing, scenery and driving are fine at Hampton as well as at Rye ; both being much frequented places by summer visitors.

*Salisbury Beach*.—This is a hard beach extending from the Merrimac River to Hampton Beach, a distance of six miles. The shore descends gradually and is very good for bathing. There is a hotel at this place which, with a number of cottages, afford room for many visitors during the summer months.

*Newburyport*.—This is an old town situated on the Massachusetts shore of the Merrimac River three miles from its mouth.

Three miles to the east is *Plum Island*, connected to the mainland by a bridge. This is a long narrow strip of land, on which a hotel and two lighthouses are located.

Newburyport had, in days gone by, a large shipping trade, but like many other New England sea-shore towns its maritime interests have declined.

*Rockport*.—A popular spot, is the town of *Rockport*, beautifully located at the end of Cape Ann. The scenery of this place is very fine.

*Pigeon's Cove* is two miles north and has finely laid out avenues and drives. The bathing is good, and it is a pleasant place for a summer's tarry, being popular and much frequented.

*Ocean View*, and *Annisquam* are also well-known resorts in this vicinity.

*Gloucester*.—The town of *Gloucester* four miles south of Rockport, and about thirty miles from Boston, has a fine harbor, and is the centre of the northern fishing interests as well as a popular place. Two miles from the city at the entrance of the harbor is the mass of rock known as the "Reef of Norman's Woe," the dread of sailors, made famous by Longfellow's Poem "The Wreck of the Hesperus," in which he graphically describes the loss of the vessel which tradition says occurred in the latter part of the seventeenth century, as follows :

" And fast through the midnight, dark and drear,  
Through the whistling sleet and snow,  
Like a sheeted ghost the vessel swept  
Toward the reef of Norman's woe."

*Magnolia*.—Some three miles south of Gloucester is a



place named Magnolia, so called from the great number of luxuriant magnolias growing wild thereabout.

Whittier tells us

“Of the marvellous valley hidden in the depth of Gloucester woods,  
Full of plants that love the summer, blooms of warmer latitudes ;  
Where the Arctic birch is braided by the tropic's flowery vines,  
And the white magnolia blossoms star the twilight of the pines.”

*Manchester*.—A couple of miles down the coast we come to Manchester, which has a “singing beach” which is “of simple-looking light sand, but owing to some singular conformation of the atoms of sand, they triturate against each other, beneath the foot with as musical a vibration as when glass is struck against silver.” Good hotels are found at this place and fine private residences line the beach between it and Beverly.

*Beverly*.—This is an old town with very good beaches. Its chief business is shoe manufacturing ; it is two miles from Salem.

*Salem*.—Another old town and a place of great historic interest, is *Salem*, it being the first settlement in the old Massachusetts colony. The harbor furnishes good boating and fishing. There are several good hotels in the town.

*Marblehead*.—Four miles from Salem is Marblehead, another quaint old colonial town, formerly having large maritime interests but now engaged in the shoe trade. It is a fine summer resort and has an excellent harbor across which is Marblehead Neck.

*Marblehead Neck* is two miles along the shore from Marblehead and is a favorite place for camping out.

*Lowell Island*, about two miles out in the bay, has a summer hotel and is a pretty and healthful spot.

Many houses in Marblehead, still standing, were built

and occupied before the Revolution. Longfellow in writing of the town said :

“Not far away we saw the port,  
The strange, old-fashioned, silent town,  
The lighthouse, the dismantled fort,  
The wooden houses, quaint and brown.”

*Clifton Beach Bluff* and *Phillips Beach* are pleasant locations below Marblehead on the coast ; south of these places is Swampscott.

*Swampscott*.—This is the favorite resort of the wealthiest citizens of Boston, being to that city what Long Branch is to New York. It has many private residences and first-class hotels. It is about twelve miles from Boston. *Lynn*, a city of about 40,000, is on Massachusetts Bay about eleven miles from Boston, situated in the midst of interesting scenery.

*Nahant*.—Four miles north of Lynn is Nahant, a rocky peninsula which juts far out into the water. Its highest point is one hundred and fifty feet above the sea level. The beaches are very hard and the views are grand. Many summer residences are here located and also fine hotels, but it is not so popular now as Swampscott.

*Point of Pines*.—This place, nine miles from Boston, as its name indicates, is plentifully supplied with trees. It is a favorite sea-side visiting place for daily excursions from Boston.

*Chelsea*, or *Revere Beach*.—Another pleasant place, four miles north of Boston. The beach is three miles in length and visitors are well cared for. It is a favorite place for a few hours visit from Boston by excursion. This beach affords good driving, promenading and bathing.

*Nantasket*.—About twenty miles south of Boston is *Nantasket*. This place has a fine beach four miles long and

several good hotels. It has steamboat connection with Boston, the boats running several times daily.

*Cohasset*.—This is a pretty village two miles and a half from Nantasket. It is a well-known summer resort, being surrounded by charming scenery; the coast line is very rugged at this portion and lined with hotels and residences.

*Scituate*.—Five miles further south is *Scituate*, an old town with a good beach (Peggotty Beach) and a summer hotel.

*Marshfield* is a popular spot with several hotels. It is eight miles from the last-named place.

*Cape Cod*.—This is an unattractive, sandy peninsula extending out into the ocean. "For centuries the storms have beaten upon this narrow strip of sand, behind which the commerce of a state lies intrenched. The assault is unflagging, the defence obstinate. Fresh columns are always forming outside for the attack, and the roll of the ocean is forever beating the charge. Yet the Cape stands fast and will not budge." It begins at Sandwich, a town sixty-two miles from Boston; from this point the land extends about thirty-five miles to the east and, at Orleans, it begins to curve to the north and westward, extending about an equal distance in that direction, thus inclosing the Massachusetts Bay. There are several towns and villages on the Cape.

*Provincetown*, at its extreme end, is a flourishing and an interesting old place being a fishing town with a good harbor, and the centre of the cod and mackerel fisheries on the coast.

*Hyannis*, on the south shore, is growing in favor as a summer retreat.

*Yarmouth*, a few miles to the interior, is an attractive village, near which place there is a camp-meeting ground.

*Nantucket*.—This island is situated about twenty miles

south of Cape Cod. It is sixteen miles long and from three to four miles wide. Its largest town, *Nantucket*, was the chief whaling port of the world in the olden days of America, but this trade has fallen off and gone. It is now a favorite New England summer resort; it is a pretty little town, picturesquely situated and has good hotels. Delightful excursions may be made to various parts from this point. An interesting trip is to *Siasconset*, an old place situated on the south-east coast. The summer climate is very cool and enjoyable on this island, the air being pure and invigorating on account of its distance from the mainland. Its permanent inhabitants are mostly farmers and fishermen.

*Martha's Vineyard*.—The island of this name lies at a distance of thirty miles from Nantucket. It has a length of twenty miles and an average width of six miles. It is considerably resorted to during the summer, there being several favorite places located on it.

*Edgartown* and *Oak Bluffs*, in the eastern part of the island, are well patronized places in the summer season.

Near the last-named place is the great *Methodist camp-meeting ground*, where thousands of people congregate every summer, and many families stay all the season, from June to September or October, in cozy, cheery and comfortable cottages, which in some places are so compact as to make pretty streets and avenues. Although good sanitary arrangements are secured, it is not a suitable place for phthisis cases on account of the aggregation of people. Good boarding and hotels are to be found here as well as at the various places on the island. It is connected with Newport and New Bedford by a good steamboat line.

*Newport*.—This celebrated sea-side city is situated on the west shore of Aquidneck or Rhode Island (the largest of the islands of Narragansett Bay), five miles from the

ocean. It is one of the best adorned, most beautiful and most truly fashionable resorts in this country. The hotel accommodations are of the very best. Its beaches are not extensive, but they are excellent and the bathing is fine. The scenery is charming and the surroundings of costly villas and green lawns help to make the place attractive. The avenues are superb and the finest equipages daily drive over them during the season. It is one of the principal towns of Rhode Island with some historic interest and has many places in the city and its vicinity which will well repay one to visit.

*Rocky Point.*—An enjoyable trip may be made to this favorite place for “clam bakes.” It is prettily situated on a small island in Narragansett Bay and is connected by steamboat with Newport and Providence.

*Narragansett Pier.*—This place which is growing in popularity, is situated at the town of Kingston, Rhode Island, on the west shore of Narragansett Bay near its mouth. Its beach is excellent and the bathing is very good and perfectly safe. The riding and driving are very fine, to which attractions may be added those of fishing and boating, which are also first-class. Its hotels are ample and very good. Excursions can be made to various points on the Bay from this place.

*Noyes Beach.*—This is situated on the southern coast of Rhode Island, and is likewise a delightful summer home.

*Watch Hill Point.*—This is found on the extreme southwestern point of Rhode Island and is a popular resort, with well appointed conveniences for a large number of summer sojourners. It has a fine beach and beautiful scenery. With the exceptions of Newport and Narragansett Pier this is the most frequented retreat in the state.

*Block Island.*—This island lies out at sea about ten miles



from the south coast of the State of Rhode Island and an equal distance from the eastern extremity of Long Island ; it is about midway between Narragansett Pier, and Montauk Point on Long Island. It is free from land breezes and from consequent land-breeze contamination. The island is about seven miles long and from two to four wide. The southern shore presents bluffs which rise about two hundred feet above the water's edge, the land gradually descending until it reaches the opposite shore, which has a beach several miles in length and a fine surf. It has a genial climate, the air is soft and balmy and the temperature seldom rises above seventy-five degrees Fahrenheit. Whittier says of it in the "Palatine :"

" And the pale health-seeker findeth there,  
The wine of Life in its pleasant air."

Much of the island is devoted to farm lands, though the occupation of the majority of its male inhabitants is fishing. The village of *Newshoreham* is on the south coast. The hotels on the island are good and there are many excellent drives around to places of interest. The scenery extends over hill and dale with water-views in fine relief.

There are some noteworthy sea-side resorts on the Connecticut shore of the Long Island Sound.

*Stonington*.—This is an old town in the extreme eastern portion of the coast line and is quite a favorite place, having good boating, bathing, fishing and hotels.

*New London*.—Twelve miles to the west is *New London*, situated on the Thames River. In its vicinity are several charming spots for warm weather retreat.

*Saybrook*.—About twenty miles west of New London is *Saybrook*, a pretty village with good inns, situated at the mouth of the Connecticut River.

*Guilford*.—Fifteen miles further to the west is *Guilford*,

an interesting town with good summer hotels in its neighborhood.

*Branford Point*.—This place situated eight miles west of Guilford, is a fine watering place, and three miles distant is *Indian Neck*, a quiet little village; both these places offer good entertainment.

*New Haven*.—The beautiful city of *New Haven* is a few miles west, but it is not a summer resort.

*Milford* is a pretty town some miles to the westward and five miles east of *Stratford* which is a fine old place. It lies a few miles east of *Bridgeport* another pleasant summering place.

*Fairfield*.—Is a pretty place five miles west of Bridgeport, with a history dating back to colonial days. It is claimed to have the finest beach on the Sound. It has desirable boarding places. *Southport* and *Westport* are small places lying between Fairfield and *Norwalk*.

*Norwalk*.—Which is situated on a fine bay, is a home-like village with smaller places in its locality, which are in good favor. Oysters are to be had in abundance at this place. The hotels are good and its nearness to New York, brings many summer guests from that city.

*Stamford*.—A beautiful town, which with its suburbs is much frequented by New Yorkers, being but thirty-five miles from the great metropolis.

*Greenwich*.—Which is at the western end of the Connecticut shore, is an old town founded nearly two hundred and fifty years ago. It is popular and convenient of access from New York City.

#### LONG ISLAND.

This long narrow strip of land has an extensive stretch of sea-shore, the island being one hundred and twenty-five miles in length. It is studded with many delightful and

popular summering places, easily accessible from New York, Brooklyn, Philadelphia and Boston. On the northern shore, situated on the small bays and inlets skirting Long Island Sound, are a number of little villages more or less resorted to, having good hotels and fine summer homes.

*Sea Cliff*.—Among these is *Sea Cliff*, a village at a distance of twenty-seven miles from New York City; it is beautifully situated on a bluff overlooking the Sound. It was established as a Methodist camp-meeting ground, but has grown in favor with other classes of people, and has now quite a large permanent population. The boating, bathing and fishing are very good, and the boarding excellent.

*Glen Cove*.—A few miles from this place is *Glen Cove*, another delightful resort with fine summer villas, good hotels, beautiful scenery and excellent boating, fishing and bathing.

*Oyster Bay*.—The village of *Oyster Bay* lies a few miles to the east, on a beautiful bay. It is a yachtman's headquarters and has considerable reputation as a summer retreat.

*Cold Spring*.—A few miles further east is the village of *Cold Spring*, situated on an arm of the same pretty bay with a fine back-ground of hills. It has good hotels, fine drives, all water sports and pleasures, and is also quite a popular place for yachtsmen.

*Port Jefferson*.—A number of smaller places dot the shore between this point and the old town of *Port Jefferson*, (fifty-eight miles from New York), which is a small shipping centre, offering some attractions to summer visitors. It has several hotels and the hills lying back of the town are the site of summer residences.

*Greenport*.—At the eastern part of the island the popular



little place *Greenport* is found, where good boating, bathing and fishing may be enjoyed. This place has a fine harbor and shipping interests of some importance. The hotels are good, and there are also a number of private summer residences.

*Shelter Island*.—It is but a short distance across the bay to *Shelter Island*, another well known residing place. It is thirteen miles long and about four miles wide containing about 9000 acres. It is a pretty island with fine lakes and woods, excellent hotels, attractive private residences, good bathing and fishing. There is a camp-meeting ground on the island. The old town of *Sag Harbor* lies some miles south across the bay.

Many good resorts are to be found along the southern shore of Long Island, which is, for the greater portion of its length, separated from the ocean by a sand bar, which incloses several bays, the largest of which is that interesting body of water, which is known as the Great South Bay.

*Montauk Point*.—At the extreme eastern end of the southern coast about one hundred and twenty-five miles from New York is *Montauk Point*, a picturesque and pretty spot where a small summer settlement has been started.

*Southampton*.—The Hamptons are pleasant places, one of these, *Southampton*, situated on the south shore of the island, about ninety miles from New York, has been called the "Newport of Long Island." The village is separated from the sea by a strip of sand. It affords suitable accommodations for summer visitors.

*Quogue*.—This is a quiet, pretty spot, seventy-eight miles from New York. Its bathing\* beach is separated from the shore of Long Island by a creek which is famous for its crabs; the stream is spanned by a small bridge. The air of this section of the Island is very invigorating.

*The Moriches.*—These villages lie near the water about seventy miles from New York. *East Moriches* lies directly on the East Bay where still-bathing, fishing and boating may be enjoyed. The hotels are good at these places. Two miles across on the bar, at *South Beach*, those who prefer surf-bathing may there enjoy it.

*Bellport.*—Ten miles to the west is the village of *Bellport*, with its comfortable hotels and cottages. It is a short distance from the Bay and has the advantages of fishing and other water amusements.

*Patchogue*—This village is situated in the same manner on Great South Bay, about three miles further west. It has some four or five thousand permanent residents, but during the summer months its population is considerably increased. There are several good hotels and many boarding houses at this place. The Patchogue Lake furnishes fresh-water fishing, while the bay and ocean afford salt-water fishing. The ocean is accessible from *Water Island Beach*, across the bay.

The villages of *Bayport* and *Sayville*, respectively fifty-two and fifty miles from New York, are likewise fine resting places.

*Islip.*—Which is six miles west of Sayville, is a popular resort with good hotels and fine private residences. It is near the Bay and connected with it by a creek.

*Bay Shore.*—Another place situated on Great South Bay, forty-one miles from New York City, is a popular resort, containing good hotels and beautiful villas. Yachting, fishing, bathing and boating are to be enjoyed here.

*Babylon.*—Situated at a distance of thirty-six miles from New York, is this town with a population of about three thousand. It is a fashionable summer place, with first-class hotels and palatial private residences. It

is on Great South Bay opposite *Fire Island*, which is also a popular place, having an excellent hotel, still and surf bathing and good fishing.

Traveling further to the south and westward we pass *Amityville*, *South Oyster Bay*, *Freeport* and other places of summer outing.

*Long Beach*.—Crossing Hempstead Bay from the last-named place, we come to *Long Beach*, (twenty-four miles from New York), a summer location to which persons from the adjacent cities may go for a few hours, and yet one at which a number of guests stay for an entire season. It has one of the largest summer-hotels in the United States, and a number of cottages. It has a very fine beach with surf and still bathing.

*Point Lookout*, about four miles distant, is also a pleasant locality with good hotels and cottages.

*Rockaway Beach*.—This sandy stretch situated south and west of Long Beach is easily accessible from New York and adjoining cities, and is visited by many persons for a day or part of a day. It has ample accommodations for permanent guests and can be readily reached by excursion boats or rail-road, and it is connected by a ferry with *Coney Island*.

*Coney Island*.—Which is a narrow strip of sand, four and a half miles long, lying just outside of New York Harbor, ten miles from the city, is separated from Long Island by a creek. It is divided into several beaches, which improve, from a social standpoint as one goes north or eastward, away from the harbor end and the large excursion piers. The best portions of the island are the *Brighton* and *Manhattan* and *Oriental Beaches*, where there are first-class hotels. This locality, the northern or east end, is resorted to by the better class of people. It has many attractions in the way of bathing, good music and out-door entertain-

ments. Many guests spend weeks at these hotels, and others who cannot leave the populous cities for any length of time go to the island on excursions for a few hours, enjoying the ocean breezes and escaping, for a little while, the impure and heated air of the city.

#### NEW JERSEY.

The New Jersey coast presents many seaside summering places, some of which are towns with a large permanent population, while others merely consist of one or more large hotels and a few cottages. Some of these places are more exempt than others from the visits of the proverbial "Jersey mosquito," which abounds or disappears according as the winds prevail from land or sea. The resorts on this coast are easy of access from New York, Philadelphia and Baltimore, and are visited annually by a large number of persons from these and other cities.

*Highlands.*—If we start at the northern end of the coast and travel southward, we first reach the *Highlands*. These are bluffs which rise over two hundred feet above the water's edge, and are just south of Sandy Hook. The village of *Highlands*, situated on the Shrewsbury river, is a popular resort; the beach, bathing, fishing and boating are good, as well as the hotels. Both unruffled and surf bathing can be had at this place.

*Sea Bright.*—Which is located two miles south, has a permanent population of about six hundred. It is a popular summer spot and contains many cottages and several summer hotels. It is situated on a narrow neck of land lying between the ocean and the Shrewsbury river.

*Monmouth Beach.*—This place comes next *en route*. It is suitable for quiet and select families.

*Long Branch.*—This is and has been for many years, one of the most popular non-invalid resorts on the Atlantic coast. It has many fine hotels and beautiful private residences. The bathing is good. A slight bluff overlooks the beach and extends along in front of the hotels, the principal avenue, Beach Drive, skirts this bluff, giving on one side, a fine view of the ocean, and on the other, of the splendid cottages and hotels. There are other very good drives around and about the place. *Elberon* is practically a part of Long Branch as is also *West End*, or that portion adjacent to the West End hotel.

*Deal.*—This summer site has a hard beach with fine surf-bathing. It is three miles south of Elberon, and contains two hotels. It is a quaint place which has been popular as a resort from the early days of summer sea-shore visiting.

*Asbury Park and Ocean Grove.*—About a mile south of Deal are these well known flourishing places. They are popular resorts with a quiet class of people, especially those families who are rearing children and who favor temperance and religious principles. At the latter place a camp-meeting is annually held for ten days in August. Ocean Grove is an incorporated association while Asbury Park is an organized town. Both places have good beaches, bathing, boating and fishing. They are separated by Wesley Lake, which has recently been spanned by two iron foot-bridges. This is a shallow body of fresh water affording good boating for children and ladies. Its shores are lined with terraces and neat and pretty cottages.

*Ocean Beach.*—This place of resort, on the Shark river, is two miles south of Ocean Grove. It has a number of good hotels, boarding places, cottages and large villas; the lots are large, and the residences widely scattered. Its beach affords fine bathing.



*Key East.*—Opposite Ocean Beach, on Shark river, is a new and growing place by this name with a large first-class hotel and boarding places.

*Como*, is also a very pretty spot with several cottages but no hotels. It is just south of Ocean Beach.

*Spring Lake.*—Then come *Brighton*, now called *North Spring Lake*, and *Spring Lake*, the latter being a fashionable and lovely resort. It takes its name from a beautiful body of clear fresh water which abounds with black-bass and pickerel and is surrounded by shady walks, which add greatly to the attractions of the place; it is a popular boating lake, even for ladies and children. There are large hotels and many fine cottages at these places.

*Sea-Girt.*—A mile south of Spring Lake we come to another charming spot, *Sea-Girt*, forty-one miles from New York. It contains large choice hotels and boarding places, and has a fine bathing beach. It is renowned for having been the sea-side summer home of Commodore Stockton and his family during his lifetime.

*Manasquan.*—A mile further south, is the old village of *Manasquan*, which has two or more hotels, and is annually increasing in popularity.

*Brielle.*—This is a pleasant resort fifty-nine miles from New York; it has a fine beach, good drives, and a first-class hotel and cottages.

*Point Pleasant.*—A few miles south of this place is *Point Pleasant*, one of the oldest resorts on the Jersey coast, with a permanent population of about one thousand. It is situated at the head of Barnegat Bay, which is a body of water extending a long distance down the New Jersey coast, very similar in nature and situation to the Great South Bay on the Long Island coast.

*Bay Head, Mantoloking, Chadwicks, Lavallette, Berkeley,*



*Sea-Side Park, Barnegat City, Beach Haven, Bonds and Sea Haven* are places situated on the long sand bar which encloses the bay. They have surf and still-water bathing, boating, fishing and good hotels, cottages and boarding places. *Island Beach*, situated at the mouth of an inlet, has not improved very much, but will in time.

*Manchester, Island Heights, Tom's River, Bayville, Barnegat, Manahawkin and Tuckerton* are located on the other side of Barnegat Bay, on the mainland. These are places of more or less note, affording good accommodations to summer visitors.

*Atlantic City*.—This is a very popular cosmopolitan seaside city and resting place, especially with Philadelphians, being about sixty-five miles from their city, and easy of access. It is well patronized in summer, from June to October, and in winter from January to April. From New York the distance is one hundred and twenty-eight miles. It is located on an island, Absecon Beach ten miles in length, and has a permanent population of eight thousand. A salt meadow extends about five miles back to Absecon where the sand bluffs begin. It has many good hotels, with numerous cottages of all classes, while the city is underdrained and has a cautious and efficient Board of Health. Fishing, gunning, surf-bathing, hot salt-water baths in some of the hotels, and sun parlors (for winter) are among its advantages. The soil is porous and sandy and dries off quickly after a rainfall. Its winter climate is comparatively mild, as the Gulf Stream approaches the coast in this vicinity.

*Longport*.—Just below Atlantic City, is a quiet, growing place known as *Longport*. It is free from the dissipations of some of the larger and more frequented places.

*Ocean City*.—This is a small place of a few years' growth, situated on an island some miles south of Atlantic City.

*Sea-Isle City*.—Another pretty little sea-side retreat, some miles further south, with a good beach, bathing and fishing. It has two hotels and a number of cottages.

*Anglesea*.—About ten miles south of this place we come to *Anglesea*, which is about an equal distance north of Cape May. This is a quiet little resort where the fishing and bathing and boarding accommodations are good. Many fishing parties find summer recreation here.

*Holly City Beach*.—A few miles south of Anglesea is a quiet little resting place known as *Holly City Beach*.

*Cape May*.—At the extreme southern point of New Jersey, at the entrance of Delaware Bay, is *Cape May City* which is probably the oldest fashionable resort along the coast. It has the finest bathing beach in the country. This is five miles long and very hard, its excellence being known all over the land. The surf is very good and bathing can be indulged in at any time. About noon is the usual bathing hour adopted by custom. The permanent population is about fifteen hundred. It is a favorite resort with Philadelphians, Baltimoreans and southern people. There are several large hotels here which are very near the beach, and a great number of smaller boarding places. This place, like Atlantic City, is now considerably resorted to during the winter months.

*Cape May Point*.—This is on the Delaware Bay side of the Cape. It was started some years ago as a religious summer meeting retreat, but this feature has been abandoned and now it is popular as a health resort with fine hotels.

*Rehoboth Beach*.—Across Delaware Bay, opposite to Cape May, is Cape Henlopen, on the Delaware coast. A fine beach begins here which extends twelve miles to the south without a break. *Rehoboth Beach* is a place of resort five miles south of the Cape on this beach. It was started as

a Methodist camp-meeting ground, but has outgrown this feature and is now in favor and popularity as a summer pleasure and health resort. The surf is fine and the bathing safe. There are a number of fresh-water lakes in the vicinity, which supply good drinking water and also good boating and fishing. There are several good hotels and numerous boarding places and cottages.

*Ocean City, Md.*—Some miles further down the coast we come to *Ocean City*, a delightful place, situated on a strip of sand lying off the Maryland coast. It has good surf-bathing and boarding accommodations.

As we travel southward along the coast we come to a number of places which are resorted to during the entire year. In the summer months, principally by the residents of the neighboring cities; and in the colder weather by persons driven southward by the rigorous winters of the more northern states.

#### CHESAPEAKE BAY.

On the irregular shores of this beautiful body of water numerous health stations are located, some of which are open throughout the year. The most important of these are the following:

*Bay Ridge.*—This place is situated on a point of land about three miles down the Bay from Annapolis, Md. It has much natural beauty and is easy of access from Richmond, Washington, Baltimore, Philadelphia and New York. There is here good bathing and fishing and a large hotel.

*Old Point Comfort.*—This beautiful and historic spot, is situated on the Virginia shore of the Chesapeake at the entrance of Hampton Roads, about thirteen miles north of Norfolk. Its far-famed hotel is but one hundred yards from Fortress Monroe, the largest fort in the United States, which,

with the surrounding waters and neighboring section of country was the scene of many important military engagements during the Revolutionary war and the late Rebellion. The fort is a source of interest to visitors to the "Point." This is a fine place to visit at any part of the year, but especially during the spring and fall months when the climate is particularly delightful.

*Newport News.*—This is a popular new place situated on Hampton Roads about eight miles above Old Point Comfort, and like the latter, it is a delightful "middle ground" as to location and climate, the average winter temperature being 47° Fahrenheit. The scenery is attractive and the boating, driving, bathing, fishing and gunning are good. There is a new large first-class hotel at this place.

*Virginia Beach.*—Seventeen miles east of Norfolk we find the new place known as *Virginia Beach*, which is situated immediately below Cape Henry on the Atlantic coast. It has a good beach, surf-bathing and a large hotel. It is well patronized as a summer resort by residents of the southern cities.

*Charleston.*—From Virginia we do not pass any sea-side places of particular note, as we journey southward along the coast, till we come to *Charleston, S. C.* The climate of this vicinity is claimed to be very similar to that of the favorite resorts of southern Europe. The harbor of Charleston is very fine and contains *Sullivan's Island* which is a popular retreat, many northern invalids spending the winter here. *Mount Pleasant* is another such place in the harbor; it is a favorite summering place for the inhabitants of the city.

*Savannah.*—The model southern city of Georgia, is known world-wide for its beauty, comfort and healthfulness. It is not situated on the sea-coast, but on the bank of the Savannah river about eighteen miles from its mouth.

*Brunswick-by-the-Sea.*—*Brunswick, Ga.*, has been rechristened by this title and is becoming a favorite winter resort on account of the beauty of its scenery, its equable salubrious climate and its nearness to the sea. Excellent accommodations are afforded by its beautiful new hotel completed last year; there are also other houses where guests are well provided for. The pine woods in the vicinity add to the healthfulness of the place.

#### FLORIDA AND THE GULF COAST.

*Fernandina.*—Florida has a number of sea-side resorts; the most northern is *Fernandina* on the eastern coast, situated on the Amelia Island at the mouth of the Amelia River, about fifty miles north of Jacksonville. The winter climate is mild and equable. It is an old town with a permanent population of three thousand. It has a good beach and excellent hotel accommodations.

*Fort George Island.*—This is a wooded, lovely spot at the mouth of the St. John's River, with shell roads cut through the natural forest of live-oak, magnolia and palmetto trees. There is a good hotel here with gunning, fishing and boating and never failing springs of the purest water.

*Pablo Beach.*—This is a new sea-side resort on the coast, a few miles south of the mouth of the St. John's river. It has a fine hotel and cottages; the hunting, bathing and fishing are good, and its beach is unexcelled. It stretches away in an unbroken line to the town of St. Augustine.

*St. Augustine.*—Which is situated on the Florida coast about thirty-three miles from Jacksonville, is the oldest settlement of European origin in the United States, and has many landmarks of great interest, which are the remains of the Spanish settlement started in 1565. Its permanent



population is about two thousand, and this is quadrupled during the winter months. The climate is mild and equable, and the hotels are first-class, and some magnificently fitted up with the latest improvements and conducted in the best northern style. There are several places south of St. Augustine, situated on lagoons or arms of the sea. These are *New Britain*, *Daytona* and *Port Orange* on the Halifax River; *New Smyrna*, on the Hillsboro River; and *Titusville* and *Rock Ledge*, on the Indian River.

*Key West*.—Florida has a long stretch of coast line on the Gulf of Mexico. *Key West* is situated on an island of the same name, at the southern end of Florida, at the entrance of the Gulf. It has a population of seven thousand, being next in size to the celebrated city of Jacksonville, on the St. John's River, some miles back from the sea. The climate of *Key West* is thoroughly tropical.

*Tampa*.—This town on the west coast of Florida, is an excellent winter resting place. The scenery hereabout is beautiful, the fishing excellent, the game in abundance and the vegetation tropical. The hotels are good.

*Cedar Keys*.—This is a flourishing village with a population of seven hundred; it has a fine mild climate. It does not offer, however, very comfortable quarters for invalids.

*Pensacola*.—This place situated on a bay of the same name, is the largest town of western Florida and has a population of twelve thousand. Its winter climate is mild and equable; the surrounding country is sandy and covered with a pine growth.

*Mobile*.—A few miles west of Pensacola, is *Mobile, Ala.*, situated on the Mobile River near its entrance into the bay of the same name. It is a beautiful city with a pleasant winter climate, although considered somewhat damp. Its hotels are good.



Along the Gulf coast there are a number of smaller places of resort mostly of local interest.

*Galveston*.—This, the largest city and commercial metropolis of Texas, is situated on the north-eastern end of Galveston Island, at the mouth of the bay of the same name. The city is finely laid out, and some of its streets are lined with oleander trees. It has a population of thirty-five or forty thousand, and affords good hotel accommodations. The island upon which it is situated is twenty-eight miles long, with an excellent beach throughout its entire length, easily accessible and quite adjacent to the built-up portion of the city. Daily lines of steamers run from Galveston to *Indianola* and *Corpus Christi*, pleasant places, located on the Gulf coast some miles further south. Steamers also run to New Orleans.

#### THE PACIFIC COAST.

Many delightful sea-side resorts are found upon the western coast of the United States. The most noted of these are situated in California, the great Pacific State which has a sea-coast equal in extent to the distance, on the Atlantic sea-board, from Massachusetts to Georgia.

*San Diego*.—The most southern of these resting places, situated about fifteen miles north of the Mexican border, is this beautiful, flourishing and salubrious city of San Diego. It has the finest harbor on the Pacific coast, south of San Francisco, with its large bay and arms. Its climate is wonderfully bracing and equable, the mean temperature being sixty-two degrees, seldom rising to eighty or sinking to the freezing point. The air is particularly dry and free from the fogs which are found farther north along the coast; the average rain-fall is but ten inches per annum. The first Franciscan mission was established some miles north of the

present flourishing city of San Diego, and the few remaining houses of the mission are called the "old town" of San Diego. The dry spring-like climate all the year round, induced many persons to locate here with their families for their health, and, as the years passed, the invalids have been restored to health, engaged actively in business and become permanent residents. Across the harbor, situated on a peninsula, is the new resort known as *Coronado Beach*. It has a fine hard beach and good surf bathing the entire year. A magnificent hotel is situated on a low bluff overlooking the beach; a number of pretty cottages have also been erected here. A ferry connects the place with San Diego. It is a resort suitable for any season of the year, and is destined to rival other American health stations on the Pacific coast.

*Santa Monica*.—This is a delightful sea-side resort, where, as at other Southern Californian places, bathing may be indulged in during summer and winter; it has a fine beach and is very near to the Sierra Santa Monica, a range which lends beauty to the scene. It has an excellent hotel situated on a bluff above the beach. This place is about sixteen miles from Los Angeles.

*Santa Barbara*.—Like many other cities of California, this has grown out of an old Spanish Mission. It was founded during the last century, by the brave Franciscans, who have left many traces of their former abode. It is beautifully situated in a sheltered nook on the coast and is protected on the north by ranges of mountains. It is one of the most popular watering places on the Pacific coast. Its climate is mild and equable; the average summer temperature is seventy degrees, and in winter it is fifty-three degrees. It is a spot highly favored by nature, fruit and flowers growing the entire year, mountains form the background, while

sea-ward is the charming view of the islands of Santa Cruz, Santa Rosa, Santa Miguel, and Ana Capa. The hotels are first-class, as they are at all these popular California resorts.

*San Luis Obispo.*—This is a place with a population of three thousand. It is built on the site of an old mission ; and contains one of the largest hotels on this coast. The climate is delightful.

*Monterey.*—Which is situated at the southern extremity of the bay of the same name, is an interesting old Spanish town. It was the centre of commercial enterprise and the seat of government in the early history of California, but its glory waned as San Francisco grew into importance. During the last few years, *Del Monte*, its near neighbor, has become a popular health resort as it deserves to be on account of its natural beauty and its delightful, dry climate, as also for its fine beach and surf. Its large new hotel is luxurious, with extended grounds, ornamented lawns, flower-beds and woody retreats, fine bathing-houses on the beach and other surroundings, to make it attractive. There are also in the town of *Monterey* hotels and boarding places. Two miles to the south is *Pacific Grove*, which has a fine hotel. It is growing in popularity as a summer retreat.

*Santa Cruz.*—Situated at the northern extremity of the bay, opposite the town of Monterey, is one of the most popular watering places of California. It is pleasantly located, being protected from the winds by the forest-covered Santa Cruz mountains. It is a winter as well as a summer retreat, the climate always being mild and genial, but sometimes foggy.

Along the railroad to San Francisco north of Santa Cruz is fine scenery and forests of the large red-wood trees ; many interesting and pleasant places of resort are here, located a few miles from the coast ; they are easy of access from

San Francisco, which city has also a number of small towns in its immediate neighborhood suitable for health and pleasure, on salt-water bays.

*San Rafael.*—This is such a place near the west shore of San Pablo Bay. It is well protected by mountains on the north and west, and the air is very bracing, and free from the fogs and winds which prevail at San Francisco and render it unsuitable as a place of residence for the majority of pulmonary invalids.

*San Francisco*, and *Oakland* across San Francisco Bay, are mild, cool and delightful all winter, except somewhat foggy at certain times, with cool afternoon winds in summer from the Pacific. They are good cities for business men who require an even climate to live in. In their environs are many lovely villas and retreats, all having merit for persons with weak constitutions as well as for the healthy. Many salubrious and lovely valleys are also found all along the northern California coast.

*Clatsop Beach.*—The great watering place of Oregon, is situated at the mouth of the Columbia River, across the promontory from *Astoria* and not far from Portland, the chief city of the state.

*Illwaco.*—Passing further up the coast we come to *Ilwaco*, Washington Territory, which lies about one hundred miles northwest of Portland. This place has a fine beach, good bathing, fishing and hunting and a cosy hotel.

There are many spots on the coast of Washington Territory which would make delightful summer resorts, *Gray's Harbor* and *Shoalwater Bay* are such places. They present fine beaches and are visited by residents of the interior in search of sea-side pleasures; and will probably some day become fine watering places. At present, the most important sea-side resorts in the Territory are located on that wonderful inland

sea, Puget Sound, which has been aptly called the "Mediterranean of the Pacific." This body of water communicates with the ocean by means of the Strait of Juan de Fuca, and presents extremely fine scenery, with towering mountains on the east and west. Its climate is delightful, being mild, genial and salubrious during the entire year. It contains numerous beautiful wooded islands which vary from ten to thirty miles in length; its waters abound in fish, which, it is stated, represent eighty-five different varieties, while the lakes and mountain streams in the vicinity furnish fine fresh-water fishing, and the forests near at hand, excellent hunting. The bays and inlets which form the outline of the Sound afford good boating and yachting; and on their shore are a number of pleasant towns, where one finds the energy and spirit characteristic of the great and rapidly growing Northwest.

*Olympia.*—The Territorial capital, is a fine town in the neighborhood of which is much to attract summer visitors and sportsmen.

*Tacoma and Seattle.*—The same is true of *Tacoma* and *Seattle*, both of which towns possess features calculated to make them attractive summer resorts; good boarding accommodations are found at all of these places, while at Tacoma a very fine hotel has been erected and the recent growth of the place has been phenomenal.

*Port Townsend.*—This is another town on the Sound; and is the port of entry for the Puget Sound customs-district.

*Whatcom.*—Situated on the eastern shore of the Sound, some miles north, is the point of departure for persons desiring to visit the islands of the San Juan group, which lie ten or fifteen miles distant.

*Victoria.*—Situated on the southeastern part of Vancouver's Island, on the Strait of Juan de Fuca, is a British town



with several fine hotels. It lies very near the place just described, and may be reached by steamers from Puget Sound, or by ocean steamers from Portland, Oregon. *Esquimault*, three miles from Victoria, is the head-quarters of the English Pacific squadron, and the landing place for the ocean and sound steamers.

*Vancouver*.—At the terminus of the Canadian Pacific Railroad, a most flourishing town has, within a few years, sprung up, under the name of Vancouver. A daily line of steamers run during the summer between it and Victoria. Its climate is bracing and like the latter place is suitable for tourists and health seekers during the hot season of more southern climes.

*Metlakatla* or *Metlahcatlah*.—This mission town or village, established by a Mr. Duncan in his work of educating and reforming the wild and savage Indian tribes of this region will be found a pleasant place to visit or to remain over one trip of the Alaskan steamers, if quietness and rest be desired by those health-seekers who are fond of fishing and gunning.

*Alaska*.—A voyage to this distant part of our country is undertaken as a rule during the warm months. The Pacific Steamship Company run fast steamers for tourists only; their freight vessels continuing their trips all winter. The country is primitive throughout, and those who desire and can endure a "roughing" trip, may well seek health by a reconnoitre in Alaska. There are several places, however, upon its coast pleasant to visit during the summer months, such as *Fort Tongas*, *Fort Wrangell*, *Sitka*, on *Baranoff Island*, *Douglass Island*, and *Juneau City*. Reference will be made to these places in the chapter devoted to "Trips upon Ocean, Lake and River."



## CHAPTER IV.

### FRESH-WATER RESORTS.

Lakes of New England—Lake Regions of New York and New Jersey—Thousand Islands—Lake Ontario—Niagara Falls—Lake Erie—Lake Huron—Lake Michigan—Lake Superior—Lakes of the Northwest—California Mountain Lakes—Great Salt Lake—Lakes of Florida.

There are numerous fresh-water resorts in the United States, most of which are located upon lakes, the latter presenting every imaginable variety in shape, size, location, altitude, climate, scenery, nature of waters and kinds of fish contained therein.

Lakes affect the climate of the locality in which they are situated by cooling the atmosphere, and in the case of large bodies of water, by purifying the air; moreover they afford much amusement and sport in the way of fishing, boating and bathing, and usually they greatly add to the beauty of the scenery. The larger lakes of the United States are located mostly in the northern section of the country, the exceptions being the lagoons in Louisiana and Florida, and the lakes in the highlands of California. We will give a brief description of the most important of these places, beginning with those located in the New England States and proceeding westward.

*Moosehead Lake.*—This is the largest of the many lakes in Maine (thirty-five miles in length), and is situated in the northern part of the state among the hills on the verge of the great Maine forest. Its elevation is over one thousand feet above the sea, with which it is connected by the Kennebec River. Its waters are deep and clear, containing

trout and other kinds of fish, while the surrounding forests are inhabited by a variety of game. On the southern shore of the lake the small village of *Greenville* is located, where there are several hotels and boarding places; from this point a small steamer runs daily to the other end of the lake, and also to *Mt. Kineo*, a small elevation overlooking the lake on its western shore, at the base of which the best hotel of the vicinity is situated. At the north-eastern end of the lake is *Mt. Katahdin*, (5385 feet high), from the summit of which a very fine view of the lake and the surrounding country can be obtained. Trips of exploration may be made, with the assistance of guides, into the adjacent forests and upon the rivers and lakes of this district.

*The Rangely or Androscoggin Lakes.*—These are located in the northwestern part of Maine, twelve to fifteen hundred feet above the level of the sea. They are six or eight in number and are connected by streams so as to make a continuous water-way fifty miles in length; the lowest lake of the chain, *Umbagog*, extends into New Hampshire. This region is deeply wooded and in most parts wild and uninhabited by man, it being the home of the lynx, deer, bear, moose and caribou, while in the lakes, trout, salmon and other fish are found in abundance. The lakes are surrounded by mountains, some of which attain a height of five thousand feet. Comfortable hotels are located at intervals along the shores, while persons who desire to camp out find pleasant spots for this purpose. Several small steamers ply these waters during the season. This section is a favorite region for hunters and sportsmen.

*Sebago Lake.*—Which lies in the southwestern part of Maine, about seventeen miles from Portland, is a deep, clear body of water, twelve miles in length and connected with *Long Lake*, (fourteen miles long), by the Songo River.

Steamers make daily trips through the lakes to *Harrison* at the northern end of Long Lake, a distance of thirty-four miles. There are hotels at this place and in the neighborhood, *Bridgeton Centre*, but one mile distant, is a delightful summer stopping place.

*Lake Winnepesaukee.*—The largest lake in New Hampshire, is situated in the centre of the state south of the White Mountains ; it is a beautiful body of water, twenty-five miles long, irregular in shape, five hundred feet above the sea-level and contains two hundred and seventy-four islands. There are good hotels in the vicinity. *Centre Harbor* is a favorite place of resort, situated at the head of the lake ; it has excellent boarding accommodations. *Squam Lake*, a lovely sheet of water, situated about two miles and a half northwest of the village of Centre Harbor, is six miles in length, studded with islands and abounding with fish.

*Lake Dunmore, Vt.*—This is a small, extremely pretty lake, situated at the base of the Green Mountains eight miles from *Middlebury*, at which place there are good hotels. There is a summer hotel or two and some cottages situated on the west shore of the lake.

*Lake Memphramagog.*—Which is situated partly in Vermont and partly in Canada, is thirty miles in length, very picturesquely located and contains a number of islands. *Newport*, at the head of the lake, offers attractions to visitors ; pleasant hotels are found at other points along its shores.

*Willoughby Lake, Vt.*—This is a pretty little lake, seven miles in length and surrounded by mountains ; there is a good hotel in its vicinity.

Many lakes are contained in New York State and a great portion of its boundary line is formed by these bodies of water.

*Lake Champlain.*—Which lies between New York and

Vermont in a valley enclosed on the east by the Green Mountains and on the west by the Adirondack Mountains, is a fine body of water, one hundred and twenty six miles in length. Its shores are irregular, forming many picturesque bays, while its surface is studded with about fifty islands. It is navigable throughout its entire extent by vessels of considerable size. There are fine steamers making connection with the different points on the lake. *Whitehall* is located at the head or southern extremity of the lake and is a lumbering village with a population of about four thousand five hundred. It is about seventy-seven miles from Albany. *Fort Ticonderoga*, built by the French in 1756, is twenty-four miles down the lake, at its confluence with the outlet of Lake George. It has a prominent place in the history of this country, but only the ruins of the fort now remain. *Port Kent, N. Y.*, on the west shore, ninety miles north of Whitehall, is a point of entrance to the Adirondacks. *Plattsburg, N. Y.*, some miles north, is a pretty village at the border of the Adirondack wilderness, where the Saranac River flows into the lake. *Burlington, Vt.*, on the eastern shore is a flourishing city of about fifteen thousand inhabitants.

*Lake George.*—This is one of the most beautiful and popular lake resorts in this country. It is about thirty-five miles in length, surrounded by high hills and beautiful scenery, and its bosom is decked with numerous little islands, commonly supposed to correspond in number with the days of the year. A steamer runs between *Caldwell* at the southern end of the lake and *Baldwin* at the northern extremity. Good hotels are to be found at these places, as well as at *Bolton* and *Hague*, villages located on the western shore.

*The Lakes of the Adirondack Region.*—These are numerous, being about one thousand in number, with an average altitude of fifteen hundred feet above the sea-level. They are

located in the valleys between the mountains, and vary in size from those twenty miles in length to others having merely the area of ponds. These lakes, which are connected by streams, are the chief roads of travel through the mountains, trips being made, with the assistance of guides, in light bark canoes. The largest lakes are *Long Lake*, *Fulton*, *Tupper* and *Saranac Lakes*; *Lakes Sanford*, *Colden*, *Raquette*, *Eckford*, *Henderson*, *Forked*, *Pleasant* and *Newcomb*. At or near the most of these, hotel accommodations may be found. Some of the smaller lakes are *The Luzerne*, *Paradox*, *Schroon*, *Blue Mountain*, *Ausable*, *Avalanche*, *Round*, *St. Regis*, *Piseco*, *Abpersand*, *Beach's* and *Rainbow*. *Lake Perkins*, the highest, attains an altitude of about four thousand feet. This region is a favorite resort with sportsmen, and for parties desiring to camp-out, but the hotels offer excellent fare for those unable to bear the exposures of camp life.

There are several fine lakes east of the lower portion of the Hudson River.

*Lake Mohensick*.—This is a pretty body of water, six miles east of Peekskill, nine hundred feet above the surface of the river, and surrounded by beautiful scenery.

*Mohopac Lake*.—Which is fourteen miles distant, is one of a group of twenty-two lakes. It is situated about one thousand feet above the level of the sea and is quite popular, with ample hotels and cottages. The other lakes of this group are visited for health and offer good boarding accommodations.

*Lake Ronkonkoma*.—In the central portion of Long Island (about fifty miles from New York City), there is a very pretty body of fresh water known as *Lake Ronkonkoma*; its waters are clear and well supplied with fish, and its shores afford good bathing. It is quite an attractive



place, particularly for sportsmen and artists. It has good hotels.

In northern New Jersey, among the highlands, we find a lake region where the summer climate is pleasant and bracing.

*Budds' Lake*.—Which is also known as *Lake Senecawana*, is situated in this region on the summit of a range known as Schooley's Mountains. The lake is very beautiful, being deep and clear and affords good fishing and boating. It is at a convenient distance from New York City. The accommodations are very good.

*Hopatcong Lake*.—Situated a few miles to the east, is a beautiful body of water, nine miles in length, dotted with islands, and containing large quantities of fish. There are several good hotels here. Its scenery and the comparative nearness to New York City (fifty miles) combine to make it a desirable place to visit, especially with persons connected with that city.

*Greenwood Lake*.—This lake region extends northward over the boundary line into New York State where we find the pretty *Greenwood Lake*, one of a cluster of beautiful lakelets, which, as its name suggests, is surrounded by mountains and woodlands; its length is ten miles, and it affords excellent boating and fishing. Good stopping places are found in its vicinity; it is a favorite resort for sportsmen, as is also the Shawangunk Region, which lies to the north, bordering on the Hudson between Kingston and Poughkeepsie and extending through Ulster, Sullivan and a part of Delaware Counties, New York. There are many pleasant boarding places scattered through the region and the adjacent Wallkill Valley. *Lake Mohonk*.—The Shawangunk Mountains are a small range extending through Ulster County; at their northern extremity, a few miles west of the



Hudson, are two beautiful lakes. One of these, *Lake Mohonk*, near the summit of the Sky Top Peak, at an altitude of one thousand two hundred feet above the sea, is a lovely mountain lakelet about one-half a mile in length, clear as crystal and surrounded by rock formation and picturesque scenery. The accommodations are desirable at the hotel on the lake; this is a favorite resting place for persons of refined and quiet tastes.

*Lake Minnewaska*.—Another mountain gem, is located a few miles to the south-east (about ninety miles from New York City), this is one thousand eight hundred feet above the sea-level, and has a cool and pleasant summer climate, excellent hotel accommodations and fine scenery.

*Lake Otsego*.—Travelling further northward we reach *Otsego Lake*, which is located in the county of the same name, about ninety miles west of Albany, in a section of country rendered classical by the writings of J. Fenimore Cooper. His description of the lake reads as follows: "A broad sheet of water, so placid that it resembles a bed of the pure mountain atmosphere compressed into a setting of hills and woods. Nothing is wanted but ruined castles and recollections to raise it to the level of the Rhine." This lake is the chief source of the Susquehanna River; it is nine miles in length. *Cooperstown* is located at its southern point; this is a favorite summer resort, and was at one time the home of the author, in honor of whom it was named. Many places of interest are found in the neighborhood.

*Schuyler's Lake*.—This is a few miles west; it is connected by a stage line with Otsego Lake. It is a fine body of water, three and a half miles in length, surrounded by hills and interesting scenery. At its head is the popular summer watering place of Richfield Springs, (of which mention is

made in the chapter on Mineral Springs). The hotels are well located and are excellent at this place.

*Trenton Falls.*—About fifty miles on to the north-west (sixteen miles north of Utica), there is a pleasant spot affording good hotel accommodations, known as *Trenton Falls*, situated on the West Canada Creek, an affluent of the Mohawk, which is in turn a branch of the Hudson River. The waters of the creek make a descent of over three hundred feet in two miles, by a series of cataracts. It is a romantic spot situated at the border of that region in northern New York, where nature reigns undisturbed in the "forest primeval," displaying her charms in solitude, until they reach their climax in the Adirondack lakes and mountains. George William Curtis, in his "Lotus Eating," says: "Trenton is the summer-song of rest. Beauty and grace are its praises. You hear them from those who are either hurrying to the grandeur of Niagara or from those who step aside to enjoy the music of the greater cataract softened into an exquisite echo. The charm of Trenton is unique, and in some choice niche of memory you will lay it aside, not as a sublime statue nor prophetic and solemn picture, but a vase most delicate, and chased with pastoral tracery."

The central and western portion of the state of New York is a lake region, where these beautiful waters are surrounded by a rich agricultural country, where mountains, cascades and glens, make the scenery charming and romantic.

*Lake Oneida.*—The most eastern of these lakes, is a delightful summering spot. Its waters are filled with fish; its length is twenty-two miles, and it lies eight miles from Chittenango Springs. *Sylvan Beach* is a pretty place situated on its shore. It has considerable local popularity, also a fine bathing beach and other attractions. The lake con-

tains two islands, of which tradition says: "When the Great Spirit formed the world, His smile rested on the waters of the blue Oneida, and *Frenchman's Island* arose to greet it. He laughed, and *Lotus Island* came up to listen."

*Onondago Lake*.—This lies a few miles to the south, it is seven miles in length and fish abound therein. *Syracuse* is located on its banks; this is a prosperous city of about sixty thousand inhabitants.

*Skaneateles Lake*.—Situated some miles to the south-west, is ten miles in length and nearly nine hundred feet above the sea-level. It is surrounded by hills rising over one thousand feet above its surface. At the northern end of the lake the town of the same name is located, and at the southern end is the village of *Glen Haven*. Both of these places are summer recreating points, at which season they are connected by a steamboat line. About ten miles south-east of Skaneateles Lake is located the pretty little *Otisco Lake*, surrounded by towering hills.

*Lake Owasco*.—A few miles to the west, is charmingly situated, and is twelve miles in length. Its waters are very clear and are filled with fish. The attractive city of *Auburn* is situated at the mouth of the lake. It has an elevation of twelve hundred feet above the sea-level, and a population of about thirty thousand.

*Lake Cayuga*.—Located several miles further west, is a long, narrow body of water, its length being thirty-eight miles. It is thus described by A. B. Sweet, in his charming poem of "Frontenac:":

" Sweet sylvan lake ! beside thee now  
Green hamlets point their spires to Heaven ;  
Rich meadows wave, broad grain-fields bow,  
The axe resounds, the plow is driven :  
Down verdant slopes roam herds to drink ,  
Flocks strew, like spots of snow, thy brink ;

The frequent farm-house greets the sight,  
 Mid falling harvest's scythes are bright ;  
 The watch-dog's bark sounds faint from far ;  
 Shakes the ear the mill-wheel's jar ;  
 The steamer, like a gliding bird,  
 Stems the rich emerald of thy wave ;  
 And the gay song and laugh are heard,  
 But all is o'er the Indian's grave !"

It holds abundant supplies of fish, and it affords good bathing, sailing and rowing. The shores are dotted at intervals with hamlets and towns, most of which offer attractions and good accommodations to visitors. At the head of the lake, the beautiful town of Ithaca is situated, the site of Cornell University. At this point the scenery is very picturesque, there being fifteen waterfalls and cascades in the vicinity. *Sheldrake* on the western shore, is a popular place with good hotel accommodations.

*Lake Seneca*.—Which comes next in order of location, is about forty miles in length, its waters are very deep and well supplied with fish ; the surrounding scenery is fine. *Geneva* is a pleasant well-appointed town, located on the west shore of the lake, the town of *Waterloo* is situated near the outlet and the village of *Watkins* at its head.

*Watkin's Glen*.—Here the famous Glen begins and follows a tortuous course of three miles. "Properly speaking it is a series of glens rising one above the other, forming a succession of rocky arcades, galleries and grottoes, subterranean at times and again widening out into vast amphitheatres, presenting views of wildness and beauty and vistas of enchanting loveliness. A limpid mountain stream bubbling out from rock-bound springs threads its serpentine way through the gorge undergoing in its course all the picturesque variations of torrent and eddy, cascade and rapids." There is a good hotel in the Glen, and others in the town.

*Keuka* or *Crooked Lake*.—Which is twenty-two miles long is divided into two branches by a ridge of land called “The Bluff.” The lake is in a grape and wine producing region ; the hills on its banks are vine-clad. *Hammondsport* at the head, *Penn Yan* at the outlet, and other places along its shores afford suitable conveniences for summer visitors. These various points are connected by steamers plying along the lake. The boating, sailing, bathing and fishing are good.

*Canandaigua Lake*.—This lies still further west is sixteen miles long, it is narrow and deep, and situated in the midst of fine scenery and a rich grape-raising country. The banks of the lake are dotted with fine residences. The village of *Canandaigua*, located near the outlet, has a population of about five thousand and is a favorite place of summer retreat, as are also *Seneca Point* and *Woodville*. Still further west-ward is the group of small lakes which lies in the valley of the Genesee River, some miles south of Rochester. These lakelets are the *Honeoye*, *Conesus* and *Hemlock*. They are beautifully situated and offer many attractions.

*Lake Chautauqua*.—The most western lake in New York State, is located in the county of the same name, in the extreme south-western portion of the state. It is eighteen miles in length, fourteen hundred feet above the sea-level (Atlantic Ocean) and over seven hundred feet above Lake Erie. It is claimed to be the highest navigable lake on this continent with the exception of Lake Tahoe, Cal. Its shores are dotted with villages and residences, the more important points being connected by steamers which ply the lake from place to place. *Jamestown*, located at the southern end or outlet, is a town of six hundred inhabitants ; a popular place with good hotels and boarding places. *Lakewood*, also at



the lower end of the lake, is equally pleasant, as is also *Mayville*, at the head of the lake. *Chatauqua* is the site of the great university for home-study, and the annual rallying place of its students. There is much here to attract and please, and good accommodations are offered visitors.

*Lake of the Thousand Isles.*—The greater portion of the northern boundary line of the State of New York, is formed by Lake Ontario and the St. Lawrence River. At the point at which their waters blend we find the *Lake of the Thousand Isles*, which extends a distance of over forty miles down the river, containing that noted cluster of islands and islets, whose number is estimated to exceed that indicated in the name, being stated as one thousand six hundred and ninety-two, the largest group of river islands in the world ; however the Ooland Islands in the Baltic Sea are by far more numerous and charming. This portion of the river was known to the Indians as Manatoana, or the Garden of the Great Spirit. Cooper introduced these islands into some of the most interesting scenes of his "Pathfinder ;" and more recent writers have found much in their beauty to admire.

The islands vary in size and appearance from mere projections of rock, a few yards in length, to verdure-covered islands, several miles long. Some of these islands are owned by private individuals and are the site of their summer residences. The inlets and bays between the islands and those skirting the shores afford good boating and fishing. There are several pleasant places resorted to on the Canadian shore. *Round Island*, situated in the American channel of the river, is about a mile in length, it is entirely occupied by the *Round Island Park*, which is a lovely spot containing a number of summer homes and a fine hotel. Wellesly Island is one of the lar-



gest of the group and at its head the *Thousand Island Park* is located. This is a Methodist camp-meeting ground, with several hundred cottages and comfortable hotels. *Westminster Park* on the lower end of Wellesly Island is a pretty place with a number of summer cottages and an excellent hotel; it is directly opposite the village of *Alexandria Bay*, which is the most important and popular among the Islands; it is situated on the New York shore, on a point of land between two river bays. It has a population of about seven hundred. Here there are many beautiful summer residences, and a number of fine hotels.

*The Lakes of Theresa*, about eight miles south-east of the village of *Alexandria Bay* are romantic in scenery and rich with fish.

*Clayton*, a village on the New York shore, twelve miles west of *Alexandria Bay*, is also a summering place, with good hotel accommodations. The boating and fishing in its vicinity are excellent.

*Cape Vincent*, situated eighteen miles south-west of *Clayton*, at the head of the Lake of the Thousand Islands, and in sight of the waters of Lake Ontario, is a pleasant place with good hotels; it is particularly frequented by disciples of Isaak Walton, the fishing in this vicinity being excellent. The more important points in the Thousand Island region are connected by steamboat trips.

#### LAKE ONTARIO.

On the shores of *Lake Ontario* there are a number of summer resorts, many having merely a local popularity. The most important places on the Canadian shore are *Kingston*, *Toronto* and *Hamilton*.

*Sackett's Harbor*.—On the New York shore, near the

foot of the lake, we find this old settlement; it is a military station, and quite a favorite summer stopping place. Yachting, boating, bathing and fishing are some of its attractions. *Henderson Harbor*, eight miles west, is also a pleasant spot.

*Oswego*.—*Lake View*, *Port Ontario* and *Mexican Point* afford good fishing; they are located on the shore, between the last-named place and *Oswego*. The latter is a handsome, pleasantly located city of about twenty-five thousand population. It lies on the shore of the Lake, at the mouth of the Oswego River.

*Rochester*.—Journeying westward we pass *Fairhaven*, *Port Haven*, the *Bluffs* and *Sodus Point*; thirty-five miles west we come to *Charlotte*, the port of Rochester, located at the mouth of the Genesee river, seven miles from the city. In its vicinity there are several popular lake-resorts, these are *Ontario Beach*, *Windsor Beach*, *Lake Bluff*, *Sea Breeze*, *Irondaquoit Bay*, *Lake View*, *Lake Beach*. They are pleasantly located, have good hotel accommodations and excellent boating and fishing. *Lakeside* and *Olcott* are delightful places, located on the shore between this point and the mouth of the Niagara river.

*Niagara Falls*.—The western boundary of New York State is limited by *Lake Erie*, the waters of which, combined with those of Lakes Superior, Michigan, Huron and other smaller bodies of water, enter Lake Ontario through the Niagara river. At a point in this stream, twenty-two miles from Lake Erie and fourteen miles from Lake Ontario, the waters make the wonderful descent known as *Niagara Falls*, which consist of three separate, flowing, plunging volumes—the “Horse Shoe,” on the Canadian side; the “American,” on the New York side; and the “Central,” between the islands (Lena and Goat) in the river. The combined length of these cascades is three thousand

feet. Numerous attempts have been made to fully describe this great natural curiosity, by the best of writers, such as Charles Dickens, Anthony Trollope, Mrs. Sigourney and many others, but they have declared it to be a hopeless task, and certainly it is one that we shall not undertake. There are many places of interest in the neighborhood of the Falls, and large excellent hotels are found on both sides of the river. It has recently been made quite free and accessible to all its wonders on the American side through the liberality of the State of New York.

#### LAKE ERIE.

Lake Erie is the least beautiful and attractive of the Great Lakes, it is three hundred miles long, sixty-five wide and one hundred and twenty-five feet deep. There are several places of importance located on the United States side of the lake.

*Buffalo.*—The city of *Buffalo* is situated on the foot of the lake, at the mouth of the Buffalo river and at the head of the Niagara river, about twenty-two miles from the Falls ; this is a prosperous place of considerable commercial importance and has a population of about two hundred and forty thousand. *Dunkirk, N. Y.*, lies forty-two miles west on the southern shore of the lake.

*Erie.*—The old city of *Erie* is about fifty miles further west ; situated on the arm of land Pennsylvania sends up to Lake Erie's southern shore ; this place has a good harbor, excellent hotels, a population of about thirty thousand, and is a naval station of some importance.

*Cleveland, O.*—This beautiful city with wide avenues lined with splendid mansions, with over two hundred thousand inhabitants, is situated about ninety-five miles west of Erie at the mouth of the Cuyahoga river. West of Cleveland the coast grows more picturesque, the shore is high and

precipitous, and several tributary streams enter the lake through rocky ravines; beyond this point is *Sandusky, O.*, located on its lovely bay. The town gradually rises from the shore and commands a good view of the bay; excellent hotels are found at this place.

*Put-in-Bay Islands.*—About sixteen miles off the coast from Sandusky, near the head of Lake Erie, about forty miles east of Toledo, there is a group of islands, fifteen or more in number, which is known as the *Put-in-Bay Islands*, which are a favorite place of summer resort. The largest of the group is *Kelly's Island*, from which a steamer runs to Detroit, Michigan, daily; a distance of about sixty miles. Some of the islands are still uninhabited while others are occupied by summer residences. Very large vineyards exist on some of the islands and a very fine quality of wine, much of it of good medicinal value is produced, from their fruit. The larger islands afford good hotel accommodations. Put-in-Bay is a favorite fishing ground, it is claimed to be the finest in the waters of Lake Erie.

*Lakeside*, situated on the shore outside the mouth of Sandusky Bay, is a charming place, with good hotel accommodations and several hundred cottages.

*Detroit.*—Another fine group of islands is found in the Detroit river, one of these, *Grosse Isle*, twenty miles south of Detroit, is a favorite summer retreat for the inhabitants of that place. *Detroit*, delightfully situated on the river of the same name is the largest city of Michigan, having a population of about one hundred and fifty thousand. It is a commercial centre of considerable importance. Some miles north of this city is *St. Clair, Mich.*, a pleasant resort, situated on St. Clair river, amid beautiful surrounding scenery; it is noted for its mineral springs. The vicinity of Detroit affords excellent fishing and sporting in its season. The

flats in many places along the St. Clair are valuable, fine villas and cottages having been built in these low lands, which do not seem to be unhealthy. Many salt wells and salt preparing manufactories abound along this river.

#### LAKE HURON.

This lake extends from the head of St. Clair river to the Straits of Mackinaw. Its length is two hundred and fifty miles; its width about one hundred miles; its depth varies from one hundred to seven hundred and fifty feet, and its altitude is five hundred and seventy-four feet above the sea-level. The places of most interest on its western or Michigan shore are: *Sand Beach*, *Bay City*, near the head of Saganaw Bay; *Au Sable*, *Alpena*, on Thunder Bay, and *Cheboygan*. There are other pleasant places of resort on the Ontario shores of the Lake.

Along the north shore we find *St. Joseph's Island*, *Drummond Island*, and *Great Manitoulin Island*. At the north-eastern portion of the Lake is *Georgian Bay*, noted for its beautiful islands, which in number and variety are said to surpass the Thousand Islands of the St. Lawrence river. Places of resort on the shores of the Bay are; *Killarney*, *Parry Sound*, *Midland*, *Penetang*, and *Meadford*.

*Mackinaw Island*.—At the north-western extremity of Lake Huron is Mackinac or Mackinaw Island, situated at the entrance of the strait of the same name, which connects Lakes Huron and Michigan. It is a delightful and popular summer resort, located about two hundred and sixty miles north-west of Detroit, and three hundred miles north of Chicago. The summer climate is cool, healthful and invigorating. The surrounding waters are filled with fish and the natural beauties are notable, the scenery being rocky and grand. The hotels are good. The island has an area



of two thousand acres, of which eight hundred and twenty-one have been reserved as a National Park, and another hundred as a military reservation.

#### LAKE MICHIGAN.

The shores of this Lake are dotted with pleasant summer retreats. *Mackinaw City*.—On the south side of the Straits of Mackinac is *Mackinaw City*, on the opposite side, *St. Ignace*.

*Petoskey*.—On the east shore of the Lake are a number of summering places many of which are located upon two beautiful bays; the more northern of these inlets is Little Traverse Bay, upon whose shores we find *Petoskey*, a town of about four thousand inhabitants, having good beaches, inclosed by hills, and possessing a cool, healthful summer climate. Here are also *Harbor Springs*, *Harbor Point*, *Bay View*, a camp-meeting ground and the head-quarters of Michigan-Chautauqua interest; and *We-que-ton-sing*. All of these places afford good entertainment for guests.

*Charlevoix*.—This is a beautiful summer resort on the lake shore between the two bays mentioned. It lies at the mouth of the Pine river, which is the outlet of Pine Lake, and affords ample stopping places.

*Traverse City*.—The second, larger and more southerly bay is the Grand Traverse; at its head is *Traverse City*, one of the most delightful of the many pleasant spots of this region of northern Michigan. Its population is about three thousand, and its hotels are good. Other places of resort on the shores of this bay are: *Old Mission*, *New Mission*, or *Omena*, *Northport*, *Norwood*, *Elk Rapids*. These all afford special attractions to persons in search of a cool, bracing, summer climate, delightful scenery, hunting and fishing, and comfortable quarters.



On the eastern shore of the lake below Grand Traverse Bay, are other places such as : *Manistee, Muskegon, Grand Haven, South Haven* and *Michigan City*.

On the western shore the most southerly point of interest is *Chicago* ; traveling northward we find *Evanston, Highland Park, Lake Forest, Lake Bluffs, Waukegan, Kenosha, Racine, Milwaukee, Sheboygan, Manitowoc, and Two Rivers*, all pleasant places with good hotels.

On Green Bay, an arm of the lake, we find the towns of *Memominee, Marinette* and *Green Bay*.

#### LAKE SUPERIOR.

This is the largest body of fresh water in the world. It has a rocky shore line of fifteen hundred miles, which presents many delightful summer resorts. Its waters are wonderfully clear, very cool, and filled with fish.

*Sault Ste. Marie*.—On the St. Mary's river, which carries the waters of this lake into Lake Huron, is *Sault Ste. Marie, Mich.*, a growing town, pleasantly situated, and considerably visited in summer. On the Canadian side of the river are several fine trout-fishing localities.

*Pictured Rocks*.—The southern shore of the Lake, at its eastern extremity, about *White Fish Point*, presents a succession of dreary "sand dunes," or hills, which, about seventy miles west of the last-named place, give way to that famous range of sandstone cliffs known as *Pictured Rocks*, which present most curious forms, produced by the action of wave, storm and frost ; and great variety of colors, caused by the stains of different minerals. These bluffs rise abruptly from the waters edge to the height of three hundred to five hundred feet, and extend a distance of five miles along the shore. The "Pictures" may be visited from the town of *Old Munising*, which lies a few miles to the

west, on the Munising Bay, behind the shelter of *Grand Island*.

This region is beautiful in scenery and affords excellent opportunities for camping, hunting and fishing.

*Au Train*, a few miles further west, situated on the Lake shore, is a favorite resort with sportsmen. Thirty miles west of Au Train is *Marquette*, the centre of the iron interests of this region. The Bay of Marquette affords good boating and fishing. Pleasant excursions may be made to places of interest in the vicinity, such as *Presque Isle*, *Mt. Mesnard*, *Granite Point* and *White Fish Bay*. Good accommodations are found at Marquette; its summer climate is cool and bracing. Some miles west of Marquette is *L'Anse*, situated at the head of the Keweenaw Bay; still further west are the towns of *Houghton* and *Hancock*, situated opposite to each other on Portage Lake in the midst of a rich copper mining district.

Again west of these places we find the town of *Ontonagon* at the mouth of the river of the same name. Seventy miles west of Ontonagon is *Ashland*, situated on the Chequamegon Bay, an arm of Lake Superior. This place is four hundred and eighty-three miles from Chicago and is fast becoming a favorite place of resort with tourists and sportsmen. Its hotel accommodations are excellent, and its summer climate cool and delightful. The town of *Bayfield*, sixteen miles northwest on the shore of the Lake, is a pleasant place with good hotels.

A group of more than twenty islands known as the *Apostle Islands* lie off the coast a few miles to the north-east of Bayfield. They present clay and sandstone cliffs which have been worn into fantastic shapes by the action of water. These islands are for the most part uninhabited, the largest, Madeline or La Point Island, is partly cultivated.

Eighty miles west we find *Duluth*, the "Zenith City of the Unsalted Seas," situated at the head of Lake Michigan, the gateway to the great North-West. Its present population is about thirty thousand, and constantly increasing. It affords excellent hotel accommodations, has a cool summer climate, and is a favorite summer resort, as is also *Superior* on the opposite shore. The northern or Canadian shore is not much resorted to, being visited chiefly by hunters, trappers, and *voyageurs* of the Hudson's Bay Company, to whom more than half of this shore belongs.

The most important points are: *Fort William*, *Port Arthur* on Thunder Bay a good starting point for Manitoba; *Neepigon Bay*, and *Heron Bay*. The most important islands off this coast are: *Isle Royale*, *Saint Ignace* and *Michipicoton Island*.

Many delightful places of summer resort are found throughout the great lake region of northern Michigan, Wisconsin, Minnesota and Dakota, portions of which are still in a wild natural condition, while other parts are resorted to principally by sportsmen who find this a rich field. Other places hereabouts offer all the conveniences and accommodations necessary for the comfort of persons in search of pleasure and health.

*The Eagle Waters*, a chain of twenty-seven lakes connected by navigable streams and channels in northern Wisconsin, afford excellent sport to the disciples of Izaak Walton as do the *Pelican*, *George*, *Thompson*, *St. Germaine*, *Twin*, *Red Cedar*, *Rice*, *Pike* and a number of other lakes in the region.

Fine trout streams, such as *Brule river*, are found here and in the adjacent parts of Michigan, where is *Gogebic Lake*, a favorite place of resort.

*Madison*, the capital of Wisconsin, though a commercial

centre of some importance, is also a summer resort. This is due to the fact that it is located in another lake region in the southern part of the State. It is encircled by four beautiful lakes which are connected with one another and a fifth (Lake Wingia) by the tortuous Yahara river. It lies on an isthmus of land between Lake Mendota and Lake Monona. The former is nine, and the latter five and a half miles in length. The climate in summer is cool and bracing; the scenery very beautiful, and the hotel accommodations good.

The *Monona Lake Assembly Grounds* (Chautauqua), the far famed *Ton-ya-wa-thu*, and various pleasant places of resort are found among these lakes.

*Lakes Waubesa* and *Kenonsa* belong to the same group and are each three miles long. Some miles east of Madison is *Waukeshu*, a popular place of summer resort, at which are noted mineral springs. Between these places is the pretty quaint town of *Lake Mills* with its lovely *Rock Lake* which affords excellent fishing. *Green Lake* in this region is another noted place of resort. It is surrounded by forests and its waters are filled with fish. The hotel accommodations are good.

*Elkhart Lake* is still another beautiful resort. *Glenbeulah* on its southern shore is likewise a favorite place.

*Devil's Lake*, an attractive place, is surrounded by peculiar rock formations, the result of volcanic action. The scenery is very fine and the hotels are good.

The largest of these lakes is *Lake Winnebago*; at its head is the town of *Fond Du Lac*; on its west shore the town of *Oshkosh*, and at its mouth, located on opposite shores of the Fox River, are the twin cities *Menasha* and *Neenah*; in the river lying between these cities is the beautiful *Doty's Island*, a favorite resort. Seven miles down the river, at

the point in its course where the Falls occur, is the town of *Appleton*. The Telulah Springs of this place are claimed to possess medicinal virtues. *Lake Geneva*, situated near the southern border of the State, is one of the most popular resorts of the West. Its length is twenty-five miles; its waters are crystal clear and filled with choice fish. Its banks are indented by numerous inlets and dotted here and there by hotel and private residences and club houses. Steamers ply the waters from place to place; excellent boating is here enjoyed.

The State of Minnesota abounds in pine forests, and is studded with lakes, which number upwards of ten thousand; the largest of these are the *Red*, *Leech*, *Swan*, *Vermilion*, *Lake of the Woods*, *Winabigoshish*, *Millelacs*, *Bois Blanc*, *Sandy*, *Rainy*, and *Wamckin* in the north, and *Benton*, *Big Stone*, and *Sauk* in the west and south. Many of the lakes are of great beauty, especially those of the district known as Lake Park Region. Among the most famous are *Lakes Minnewaska*, *Battle*, *Clitheral*, and *Detroit*, all of which have fine beaches, fine surrounding forests, and afford excellent entertainment for all classes of visitors.

There are over two hundred lakes in the vicinity of St. Paul and Minneapolis, the most important of which are lakes *Como*, *Cedar*, *Harriet*, *Calhoun*, *White Bear*, *Bald Eagle*, and *Minnetonka*; the latter is twelve miles west of Minneapolis. It with the others, offers great attractions to those in search of health, pleasure and sport. It has large excellent first-class hotels, and is very popular as a summer resort.

Several beautiful cascades lend interest to this section of country; these are the falls of *St. Anthony*, *Bridal Veil Falls*, *Silver Cascade*, and the *Minnehaha Falls* made famous by the poet Longfellow. *St. Anthony's Falls* has lost much



of its former wildness and beauty by the inroad of manufacturing interests by diverting its waters and by protecting its frontage at Minneapolis.

In the north-eastern part of Dakota is *Devil's Lake*, but this can not be called a fresh-water retreat as it is a body of salt water about fifty miles in length ; its shores are wooded and picturesque while numerous promontories and islands add to its beauty.

*Minnewaukan*, on its southern shore is a favorite summer place.

#### FLAT HEAD LAKE, MONTANA.

The next lake of importance as we travel westward is the Flat Head Lake in Montana, a beautiful sheet of water twenty-eight miles in length and located in the Rockies, a few miles north of the town of Missoula. The Pend d'Oreille river takes its rise in the lake, and passing hundreds of miles through mountain and valley, flows into the Lake Pend d'Oreille, which is located in the northern portion of the Pan handle of Idaho. This beautiful sheet of water is forty-five miles in length and really an opening of the Columbia River.

*Hope*, *Kootenai* and *Sand Point* are places on the north shore, where visitors find accommodations and from which trips may be made into the surrounding country, which abounds in game.

*Lake Cœur d'Alene*.—This is another lovely lake in Idaho some miles south of the former ; it is thirty miles in length. Its cool summer climate makes it a pleasant summer resort. *Cœur d'Alene City*, situated on the shores of the Lake, affords entertainment for visitors.

*The Great Shoshone Falls*, of the Snake River, in the southern part of Idaho, a few miles southeast of Boise City,



is a wonderful natural curiosity, and one of great beauty. Accommodations may be had in the vicinity of the Falls.

In the northeastern portion of Washington Territory are the beautiful *Spokane Falls*, situated in the river of the same name. The town of *Spokane Falls* has a population of twelve thousand, is rapidly improving and affords good hotels. A short distance southwest is the peculiar body of water known as *Medical Lake*; as its name indicates its waters are used for medicinal purposes. A sanitarium is found at this place.

On the border between California and Nevada, we find *Lake Tahoe*, the highest navigable lake on this continent, over six thousand feet above the level of the sea, situated in the Sierra Nevada Mountains and surrounded by snow-capped peaks which tower two and three thousand feet above its surface. It has a hotel which is open during the summer months. The lake is fourteen miles west of Carson City, the capital of Nevada, and about an equal distance from Truckee, California. It is thirty-five miles in length and its waters are clear and cool and have a depth of over sixteen hundred feet. It is plied by a steamer making daily trips. A stage line connects it with Lake Donner, another beautiful mountain lake in California, three miles from Truckee.

*Independence Lake*, sixteen miles from Truckee, is also located in the Sierra. Ten miles distant is Webber Lake, which has an altitude of six thousand nine hundred and twenty-five feet. The waters of these lakes abound in fish.

The *Blue Lakes*, situated about twelve miles from Lakeport, with their beautiful scenery and ample hotel accommodations constitute one of the pleasantest summer and autumn resorts in California.

In Utah we have another lake which does not belong to the fresh-water resorts. This is Great Salt Lake. It has an altitude of four thousand feet above sea-level, is about eighty miles long and fifty miles in width and has no known outlet. Its waters contain 13.8 per cent. solid ingredients as compared with 3.5 per cent. found in ocean water. At its southern extremity is a pleasant place of resort known as Garfield Beach, which is eighteen miles south of the salubrious and well-known Salt Lake City, with its pure mountain water and irrigation streamlets running through its streets and gardens. It has a fine sand beach and affords excellent opportunities for bathing in the briny waters of the lake.

In the southern States are several fresh-water resorts. In Louisiana, five miles north of New Orleans, is *Lake Pontchartrain*, forty miles long and easy of access from the city. Its banks are sites for hotels, gardens and summer theatres. It is noted for game and fish.

Florida has a number of lakes in the neighborhood of Tallahassee ; the more important of these are : Lakes Jackson, Bradford and Lafayette. About thirty miles east is Lake Miccosukie, near the town of Monticello. Twenty miles or more to the east, in the neighborhood of the Suwannee river and near the town of Madison, are Lakes Mary, Francis, Rachel and Cherry, beautiful bodies of water.

Some miles east of Tampa are several lakes, situated in a wild picturesque country where game and fish are found in abundance ; these are Lakes Hancock, Parker, Hamilton, and Maitland, and Kissimee. There is a group of lakes around the source of the St. John's river the names of which are, Lakes George, Monroe, Dexter's, Harney, Saltee and Jessup, all of which afford sporting attractions.

## CHAPTER V.

### MOUNTAIN RESORTS.

Climate of High Altitudes—The White Mountains—The Green Mountains—  
The Adirondacks—The Catskills—The Alleghanies—The Rocky Mountains  
—The Sierra Nevadas.

The climate of mountainous regions possesses certain characteristics, such as diminished air pressure, decreased temperature, increased electric tension, dryness and purity of the atmosphere [freedom from dust and germs], as well as abundance of ozone and sunshine, which conditions combine favorably to affect some invalids physically ; while all who visit such localities are more or less affected mentally if they enjoy the grand and inspiring scenery by which they are surrounded, which when bathed in sunshine looks as if

“ Touched by a light that hath no name,  
A glory never sung ;  
Aloft on sky and mountain wall  
Are God’s great pictures hung.”

The amount of air pressure at sea-level is fifteen pounds to the square inch, and as we ascend above this point, the pressure decreases at the rate of one pound for every two thousand feet. As the effect of this diminution, there is less oxygen contained in a given volume of air, hence respiration is increased in frequency to supply the amount of that element demanded by the system. This is associated with a corresponding increase in the frequency of the heart’s action, which is sometimes a serious matter in cases of organic disease of that organ. It may amount to the condition known as *Mal de Montagne*, in which the walls of the

blood-vessels give away and hemorrhage from the nose, ears, mouth, or other orifices of the body results. The atmospheric temperature has been estimated to decrease at the rate of one degree for every three hundred feet of altitude.

There seems to be a connection between the increased electric tension of the atmosphere of high altitudes and the presence of ozone in such air; and experiment has proven that pure, dry oxygen may be transformed into ozone by means of electricity. In fact it has been proposed to substitute for its present name that of electrified oxygen.

The dryness which accompanies the rarification of the atmosphere at high altitudes, is due to the loss of part of its humid contents which follows the chilling of the air, and its expansion.

The numerous mountain resorts in this country each have their own peculiar attractions. The United States is divided from north to south by three systems of mountain ranges; in the east is the Appalachian system, a little west of the centre are found the Rocky Mountains, and far west are seen the Sierra Nevadas.

The Appalachian chain stretching from Maine to Georgia, affords great variety in mountain climate and scenery. It consists of detached clusters of mountain peaks and ranges which we shall briefly note.

#### THE WHITE MOUNTAINS.

The group located in New Hampshire, which is sometimes spoken of as "The Switzerland of America," belongs to this system. These mountains rise from a plateau in the northern portion of the State, which has an elevation of about sixteen hundred feet above the sea-level; and is forty-five miles in length and

thirty in width. There are about twenty individual peaks which range in height from four thousand to over six thousand feet; these are divided into an eastern and a western group by a table land. The former is known as the White Mountains proper, or the Presidential Range; and the latter as the Franconia Mountains. The highest peak is Mt. Washington [6,285 feet], which belongs to the eastern range; Mounts Adams [5,759 feet]; Jefferson [5,657]; Madison [5,405]; and Monroe [5,349 feet] also belong to this group. The highest of the Franconia Mountains is Mt. Lafayette [5,280 feet.] The peaks are separated by valleys and streams, cascades and picturesque lakes, which add greatly to the beauty of the mountain scenery. Entrance may be had to the mountain region on the east by the towns of North Conway and Gorham. They both afford good accommodations for the entertainment of travelers and are also favorite places of resort.

On the west the mountains may be reached through the town of Bethlehem, New Hampshire, a popular resort, with good hotels and boarding places; and on the north through the village of Jefferson, which place affords comfortable entertainment to visitors and a fine view of the mountains. There are excellent hotels found all about this region. On the direct summit of Mt. Washington there is a large, first-class hotel, chained to the rocky crest; at its base there is another hotel. Near the gateway of that famous mountain pass in the White Mountains proper, called the Crawford Notch, is one of the oldest and best known hotels in that region, accommodating several hundred guests; it is situated on a plateau about two thousand feet above the sea-level. Five miles from this point, on the road to Bethlehem, is another large hotel. Two others are in the



same vicinity, and four miles further west is still another very popular stopping place in the Twin Mountain region, a locality that has considerable reputation for the relief of "hay fever" cases.

In the Franconia range, probably the largest of these mountain hotels is located, one with a capacity for six hundred guests. It is in the neighborhood of the lovely Echo Lake, from the centre of which body of water quite a remarkable echo is heard, which was supposed by the Indians to be the voice of the Great Spirit, and near the "Profile" on the mountain cliff, seen as you drive down the gorge, and not far from the "Flume"—a peculiar fissure in one of the mountains. These places among the lofty hills are reached by means of railroads, stages and other conveyances. The summer climate in this region is delightfully cool, pleasant and healthful.

#### THE GREEN MOUNTAINS.

These consist of a long narrow group of mountain ranges which extend from north to south through the western part of the State of Vermont. Their name is derived from the verdure of their wooded slopes. Their scenery, though of a somewhat different order from that of the White Mountains, is still beautiful. From elevated points on the west, Lakes Champlain and George may be seen, and still further west the Adirondacks loom up in their majesty. Mt. Mansfield [4,348 feet] is the highest peak of the Green Mountains. The next in order of height are: Camel's Hump, 4,188 feet; Killington Peak, 3,924 feet, and Ascutney, 3,320 feet.

*Stowe*, twelve miles from Mt. Mansfield, is one of the principal places of resort in this region. It has good hotels and is surrounded by fine scenery. *Waterbury* is



another summering place, being a favorite on account of its nearness to Mt. Mansfield and Camel's Hump ; on the summit of the former peak there is a hotel.

*Rutland*, seven miles from Killington Peak, is a fine town of twelve thousand inhabitants and a point from which excursions may be made to different places in the mountains ; its hotels are attractive.

The continuation of the Green Mountain range into the State of Massachusetts is known as the Berkshire Hills. These cover an area of twenty miles in length by fifty in breadth. The highest peak is Greylock Mountain which attains an altitude of 3,500 feet. There are also a number of pleasant health retreats in this region.

In *Great Barrington* and its vicinity there are desirable places of summer residence. The beautiful town of *Stockbridge* is eight miles distant. About ten miles to the north is *Lenox*, much patronized by Bostonians and New Yorkers. Six miles above is found *Pittsfield*, with a population of sixteen thousand ; it has fine hotels and is picturesquely situated on a plateau surrounded by the Taconic and Hoosac Mountains. There are a number of interesting places near the city, to which excursions can be made.

*North Adams* is a flourishing town surrounded by romantic scenery and a commercial centre in the upper Berkshire region, and it has good hotels.

*Williamstown* is five miles westward ; it is the site of Williams College ; the town is situated in a valley surrounded by mountains. Two miles to the north there is a good summer hotel at a place named *Sand Springs* and the mineral waters of these springs have some repute. There are a number of attractive spots in the vicinity of Williamstown to which excursions may be made ; among these, considerable interest attaches itself to Flora's Glen,

where Bryant wrote "Thanatopsis," when a student at Williams College.

#### THE ADIRONDACK MOUNTAINS.

The mountains situated in the northeastern portion of New York State, between Lakes Champlain and George on the east and the St. Lawrence river on the north, consist of several separate ranges that rise from a plateau, having an altitude of two thousand feet above the sea-level, and covering an area of one hundred miles in width by one hundred and fifty miles in length.

*Mount Marcy* [5,337 feet] is the highest peak; there are others of nearly as great an altitude, such as Mount Whiteface, Mount Seward, Mount McIntyre, Mount McMartin, Dix Peak and Mount Pharoah. It has been estimated that there are five hundred individual peaks in these ranges; but only a few of these have as yet received names. The ranges are separated by valleys in which streams and lakes abound and by means of which most of the travel through this region is accomplished in light canoes. The lakes, which are estimated to be about one thousand in number, range in size from those twenty miles in length to others with an area of only a few acres. The following are some of the most important: Long Lake, Raquette Lake, The Tupper, Fulton and Saranac lakes, Sanford Lake, Colden Lake, Schroon Lake, Lake Placid, and Paradox Lake.

At various points along the lakes good hotel accommodations may be secured, as many small villages have sprung up in these localities; or, should the traveller prefer, he may camp out and enjoy nature in her primeval simplicity. The beautiful scenery of this region has been made famous by pen and brush. Entrance to the mountains may be had through various places, situated on the borders of this region,

which serve as gate-ways, and are themselves in many cases favorite summer resorts. On the east are Plattsburg, Port Kent and West Port on the shores of Lake Champlain; Keeseville and Elizabethtown a few miles west of the lake; and Caldwell at the head of Lake George. On the west Prospect, Remsen, Alder Creek, Boonville, Port Lyden, Glendale, Lowville, Carthage, Harrisville, Gouverneur, De Kalb Junction, Canton and Potsdam; on the south Saratoga, Gloversville, Devereaux, and Trenton Falls; and on the north the mountains may be reached from Norwood, Moira, Malone, and Chateaugay.

*Catskill Mountains*, also in New York State, are located on the west side of the Hudson River, following its course for twenty or thirty miles and separated from that stream by a valley ten or twelve miles in length. Some of the highest peaks are as follows: The Storking (4000 feet); High Peak (3804 feet); and Pine Orchard. This region was but little visited fifty years ago when Irving wrote his pretty tale of "Rip Van Winkle," in which the hero is represented as spending twenty years in a state of deep slumber in the heart of these hills. His description of them is so pleasing that we venture to insert a small portion of it:

"Whoever has made a voyage up the Hudson must remember the Kattskill Mountains. They are a dismembered branch of the great Appalachian family and are seen away to the west of the rivers, swelling up to a noble height and lording it over the surrounding country. Every change of season, every change of weather, indeed every hour of the day, produces some change in the magical hues and shapes of these mountains, and they are regarded by all the good wives far and near, as perfect barometers."

At the villages of Catskill, Palenville, Tannerville, Haines' Corners, Hunter, Cairo, Windham, Prattsville,

Lexington, West Kill, Pine Hill, Big Indian, Shandaken, Phœnicia, Woodstock, Andes, Stamford, and many other spots in this region, there are good accommodations. Most of these places are situated on or between the mountain ranges and in addition to these resorts there are several large, fine hotels, two of which are in the eastern Catskills, located at an altitude of twenty-five hundred feet above the sea, and commanding a fine view of the Hudson and its valley. One provides accommodations for one thousand or more guests, and is the oldest of these places of resort in the mountains. It is situated on Pine Orchard Mountain, from which point the view of the surrounding country is unsurpassed. Another large hotel, which is comparatively new, extensive and with the modern improvements, is situated on the summit of the western Catskills at an elevation of two thousand feet above the sea. It is in the vicinity of the Storm King, and commands an extended view, including the head waters of the Delaware river; its appointments are most luxurious.

The Allegheny and Blue Ridge Ranges extend through several adjoining states, as Pennsylvania, Maryland, West Virginia, Kentucky, Tennessee, North Carolina and Georgia. There are a number of pleasant places among these mountains. In the eastern section of Pennsylvania is the Delaware Water Gap. At this point the Delaware river, after traveling two hundred miles through a romantic section of country, forces its way through an abrupt notch in the mountains. The scenery is grand and the hotel accommodations are good. A few miles to the west is Lehigh Gap, a similar resort, which is not far from the old Moravian towns of Bethlehem and Easton on the Lehigh river; the latter city at its confluence with the Delaware. These attract visitors on account of the mountains near at hand,

and their healthfulness and fine climate. Two miles from the latter place is Paxinosa Inn, a new summer resort situated on the summit of the Paxinosa mountains.

*Mauch Chunk* is another eastern Pennsylvania town located in the midst of surrounding mountains. Many excursionists visit this place to take a ride over the mountains on the celebrated swift-trained Switchback railroad. The scenery is fine, and hotel accommodations, for transient guests as well as for those who desire to spend a length of time, are good. Near at hand is a beautiful ravine, known as Glen Onoko. A few miles to the north-east is a small range known as the Pocono Mountains; these attain an elevation of about two thousand feet, and contain several excellent places of summer resort, having good hotels and a cool summer climate. The names of these places are: Forks, Pocono, Summit, and Tobyhanna.

A few miles to the south there is an attractive summer place known as Parkside; it is situated on the Analomink river and has good entertainment. The mountain streams in its vicinity afford excellent fishing and boating. It is within a few miles of Prospect Ledge, Point Lookout, Silver Cascade and Red Creek Glen, at all of which places the scenery is very fine. The pretty village of Spraguer-ville is located amid the mountains in this neighborhood; it has a number of summer residences and good hotels. Broadhead's Creek, upon which the village is built, affords excellent trout fishing. *Stroudsburg* is another place of resort situated on this stream, having good accommodations; the charming resort of *Dingman's Ferry* is reached from this point by a twenty-five mile stage ride. The scenery at this last named spot is very fine, there being several waterfalls in the vicinity.

Some miles to the west is the beautiful Wyoming Valley,



noted alike in history and in song; it is formed by two parallel mountain ranges, and the Susquehanna river passes through the valley. In about the centre of the valley is the flourishing city of Wilkes-Barre, located in the neighborhood of some rich anthracite coal veins. It is a popular summer resort, although quite a city. A bridge connects it with Kingston on the opposite side of the stream. Harvey's Lake in this vicinity affords a fine place for guests and tourists. The lake is one thousand feet above the Susquehanna river, and a good hotel is located on its shores. Some miles north-west of Wilkes-Barre is Eagle's Mere, located twenty-two hundred feet above sea-level, a pleasant place, with fine scenery and supplied with suitable plans and good fare.

*Wernersville*, ten miles west of Reading, a delightful resting locality, winter and summer, is situated in the midst of the mountains; the scenery is excellent. There are several hotels in the village and its vicinity, and two sanitarium are delightfully situated upon a fine range of hills commanding beautiful valley scenery of cultivated lands charming to the vision, while the climate is particularly healthful.

In the southern and western part of Pennsylvania there are a number of summering places in the Allegheny Mountains, a few of which we will mention. In the centre of the state and mountains is Carlisle eighteen miles west of Harrisburg. There are several localities possessing mineral springs which are also places of resort. Mount Holly Springs are seven miles to the west of the town; Doubling Gap Springs are a few miles to the north-west; Perry Warm Springs are located ten miles to the north.

*The Bedford Springs* are beautifully situated in the mountains some miles to the south-west of Carlisle, at an



altitude of eighteen hundred feet above tide-water. Hotel accommodations are spacious and good at these springs.

*Cresson*, on the summit of the Alleghenies, three thousand feet above sea-level is a beautiful health-resort, easily accessible by many daily trains. The spacious hotel is well patronized, the scenery fine and the climate invigorating. Mineral springs are found here, some of which yield chalybeate water.

*Ebensburg*, eleven miles distant, is pleasantly situated and has an equable summer temperature. Its hotels are good.

*Ligonier*, in the beautiful valley of the same name, situated some miles southwest of Cresson, is a quiet, pleasant place with good accommodations.

*Altoona*, the location of the Pennsylvania Railroad car works, is situated at the eastern pass of the main Allegheny range, twelve hundred feet above the sea-level, with its beautiful surroundings; it offers many attractions as a resort, among which are excellent hotels. *Kiskiminetas Springs* are located a number of miles west in a beautiful and healthful spot, affording comfortable entertainment to visitors.

*Kane* is situated in the northern part of the State on an elevated table land; it is on the boundary of a wild tract of country which affords sport for gunner and angler. The hotels at this place are fine.

In western Maryland there are several places of resort among the mountains. *Oakland*, about two hundred and fifty miles west of Baltimore, is beautifully located amid the loftiest heights of the Alleghenies. There is a hotel at this place with a capacity for about five hundred guests; it is located in the midst of enchanting scenery. Three miles east is another pleasant place called *Mountain Lake Park*, where there is a large hotel surrounded by fine grounds

and cottages. Three miles to the eastward is *Deer Park*, which also has a large hotel and cottages. All of these places are located at an altitude of about three thousand feet above sea-level, amid lovely mountain scenery.

The mountainous regions of Virginia and West Virginia contain many mineral springs, some of which have a wide reputation for medicinal purposes. These are found in the southern and western portions of the former State and the eastern part of the latter. At most of these springs there are hotels, bath-houses and cottages; many of these localities are very popular places of resort. The individual springs with their properties are specified in the chapter on "Mineral Springs."

The mountainous regions of North Carolina and the adjoining parts of South Carolina, Tennessee and Georgia, are known as the Piedmont Country. It has a delightfully salubrious climate with a cool, pleasant summer temperature and mild winters. The climate is in many respects similar to that of the White Mountains. The general elevation has an average of two thousand feet above the sea-level, many of the peaks attaining a height of six thousand feet. The mountains in North Carolina attain the greatest altitude, one of these, Mt. Mitchell, (6,701 feet) being the highest mountain east of the Mississippi river.

*Asheville, N. C.*, is in the centre of this region. It is situated in the valley of the French Broad river, between the Blue Ridge on the east and the Alleghenies on the west. The town is two thousand, two hundred and fifty feet above the level of the sea. The hotels are desirable and the scenery very enjoyable. This is a favorite retreat, and suitable as a winter as well as a summer resort for persons desiring a cold, dry climate. Sulphur and chalybeate springs are found near the city. Thirty-seven miles

west of Asheville are the *Hot Springs* of North Carolina, located in a lovely valley surrounded by towering mountains. The hotels and bath houses are very neat at this place, which is frequented throughout the year.

*Cloudland* is a quiet summer retreat situated on the top of the Roan Mountains at an altitude of six thousand, three hundred and ninety-four feet above sea-level, the highest human habitation east of the Rocky Mountains, on the border line between the states of North Carolina and Tennessee. The summer climate is very genial, the hotels are good and the scenery superb.

There are a number of popular places among the mountains of South Carolina; one of the most frequented is the pretty village of *Greenville*, situated on the Reedy river, about two hundred and seventy miles from Charleston; this is a pleasant summer resort with suitable conveniences for visitors.

In northern Georgia there is a continuation of charming Blue Ridge scenery. *Clarksville* is a village among the mountains much resorted to during the summer by the inhabitants of the low-lands of the State. *Marietta* and *Atlanta* are pleasantly located, the former at an altitude of over eleven hundred feet above the sea, and the latter, a flourishing city, at an altitude of over sixteen hundred feet. Marietta is a favorite summer spot with Southerners, but both places are now resorted to in the colder months by persons from the northern states.

#### THE ROCKY MOUNTAINS.

This lofty system of mountain ranges extends through the states and territories of Montana, Idaho, Wyoming, Nevada, Utah, Colorado, New Mexico and Arizona. They attain their greatest elevation in Colorado, where there are

many peaks having an altitude ranging from thirteen thousand to fourteen thousand feet above sea-level, while several attain a height of three or four hundred feet more. In the midst of the towering mountains are found Colorado's Natural Parks, four in number, which consist of irregular plateaus enclosed by mountain ranges.

*North Park* covers an area of two thousand, five hundred square miles, at an elevation of eight thousand feet. It is not so much frequented by visitors as the others. *Middle Park* immediately south of the last named, has an area of three thousand square miles, with an altitude of seven thousand, five hundred feet above the sea and notwithstanding such elevation, the climate is equable and mild. In this place the Hot Sulphur Springs attract many visitors. *South Park* is the most popular and beautiful of all these. Its area is two thousand, two hundred square miles, and its elevation is over nine thousand feet. The climate is delightful and the scenery very fine. *Fair-play* is the chief town of this region and a point from which excursions are made to points of interest.

*San Luis Park*, the largest of the parks is south of the last named, and has an area of eighteen thousand square miles. Its elevation is not over seven thousand feet above the level of the sea. There is a beautiful lake of the same name in the centre of the park; the climate is very mild and thermal springs are found here.

Hunting is excellent in all of the parks. Excursionists can procure outfits and guides at *Idaho Springs*, a pretty village, whose chief claim for attention comes from the presence of the mineral springs located at the place. The climate is fine and the hotel comfortable.

*Denver*, on the South Platte river, is fifteen miles from the east base of the Rocky Mountains. It is built on a

series of plateaus facing the mountains and commanding a fine view. The population is over eighty thousand. It is the starting point for tourists making trips to the various points of interest in the State, being at the same time in itself a pleasant summer resort, as its climate is cool and exhilarating. It has numerous first-class hotels.

*Colorado Springs*, seventy-six miles south of Denver, is a pleasant place six thousand feet above the sea. Its hotels and boarding places afford good accommodations, and its climate is pleasant during the entire year. From this point excursions may be made to several places of interest. Many incipient phthisis pulmonalis cases have located here and at Denver and recovered their health and vigor.

*Manitou Springs*, at a distance of five miles, has been called the "Saratoga of Colorado;" the waters are soda and iron, the hotels and surrounding scenery excellent. *Pike's Peak*, (14,150 feet) is at a distance of sixteen miles from Manitou. The summit may be reached on horseback. A signal service station was for a long time located here. *Glen Eyrie*, *The Garden of the Gods* and *Monument Park* are places of easy access and will well repay a visit.

*Pueblo*, one hundred and seventeen miles south of Denver, has a population of eighteen thousand. Clark's Mineral Springs are found here. The climate is pleasant in winter and the hotels are very good.

In Arkansas, the *Hot Springs*, situated forty-five miles south of Little Rock, and *Eureka Springs* are favorite mountain resorts. At both places there are good hotel accommodations.

In New Mexico there are several resorts among the mountains; of these we will name *Santa Fe*, which is one of the oldest towns in the United States; it has a population of five



thousand five hundred, and an elevation of seven thousand feet above the sea. It is a mining centre and a pleasant summer resort.

*Albuquerque*, some miles south of Santa Fe, is situated on the Rio Grande at an elevation of about five thousand feet above the sea ; it has a population of three thousand, five hundred.

*Las Vegas*, east of Santa Fe, is a town of fifteen hundred inhabitants. It is the centre of trade for the sheep ranches of the State. The hot springs of the same name are located about four miles from the town and have a very favorable reputation. They are located at an elevation of six thousand, four hundred feet, and constitute a suitable place for a summer resort. The hotels are very good. The mountain valleys in the southern part of the State are more suitable for winter residence, than the places of resort here named.

*The Yellowstone National Park*, a Rocky Mountain resort of much importance and interest, is situated in the northwest corner of Wyoming, extending into Idaho and Montana. It is sixty-five miles in length and fifty-five in width, having an area of three thousand five hundred and seventy-five square miles, and an altitude of more than six thousand feet. The whole region shows the signs of recent volcanic action. There are about fifty active geysers, and thousands of mineral springs in the park, besides a beautiful lake and rivers. The best time to visit this region is during the summer and early fall months. The hotel accommodations are very good. It is under government control.

#### THE SIERRA NEVADAS.

These extend along the Pacific coast, through Washington Territory, Oregon and California. *Summit*, Cal., a



pleasant Sierra summer resort, is the highest point on the Central Pacific Railroad. It has an elevation of seven thousand and forty-two feet. The surrounding scenery is grand and the air so very dry, that meat packed away will keep at any season. Soda springs are found at this place.

*Truckee*, Cal., is a handsome town of fifteen hundred inhabitants, situated high up among the Sierras, three miles distant from the lovely Donner Lake. A daily stage runs to *Tahoe City*, on Tahoe Lake, the highest navigable body of water on this continent, and a delightful place of resort.

*Yosemite Valley* is one hundred and forty miles south-east of San Francisco, on the western slope of the Sierra Nevadas. It is a deep cut gorge six miles in length, wild and charming to the lover of bold scenery. Several lovely foaming waterfalls come rushing into the valley from the snow peaks near at hand. One of them, the Yosemite, aggregating in its three plunges about one-third of a mile in height, while some of the cliffs are one-half to three-fourths of a mile in altitude. This valley, or rather this immense chasm, is probably the most remarkable one on this continent, while towering about it lie lofty peaks of the rugged Sierra Nevada range, which runs parallel with the Pacific coast for many miles. The Merced river, made up of the waters which come in from these waterfalls, winds beautifully through the gorge, and abounds with mountain trout and other edible fish.

The health-seeker can find in this valley ample opportunity for rest and recreation, for a greater part of the summer, in exploring the gorges, climbing the cliffs and mountain sides, visiting the beautiful lakes, fishing, gunning, and roaming around among the scenes of beauty that hereabout abound. There are several comfortable hotels in the valley.

## CHAPTER VI.

### TRIPS UPON OCEAN, LAKE AND RIVER.

Benefits of Sea Air—British Maritime Provinces—The Bermudas—The West Indies—Alaska—The Sandwich Islands—The Great Lakes—The St. Lawrence River—The Hudson River—The Mississippi River—The Ohio River—The Columbia River.

In some cases a change of scene is as much, if not more needed, than a change of climate, such persons are frequently much benefitted by a trip upon the water. Oftentimes a trip of this kind may be necessary as a means of reaching a desirable place of resort at a distance, or again, as in the case of an ocean voyage, it may be indicated as a form of climatic treatment.

#### OCEAN TRIPS.

The invigorating and curative effects, which the ocean climate has upon many sufferers, have long been more or less recognized. Pliny, Celsus, and Galen testified to its virtues. The exact *modus operandi* is not fully understood, but probably much of the improvement noted is due to the following causes, which have been so concisely stated, by an able writer on this subject, that we will give them in his own words :

1. The entire change of scene and the enforced rest from customary occupations.
2. The facilities for being constantly in the open air during the greater part of the twenty-four hours.
3. The habitual respiration, when on deck, of the air free from organic and inorganic impurities and floating

particles of dust and carbon that are met with in even the purest air on land.

4. The greater equability of temperature at sea.

5. The presence in the air of certain substances, such as saline particles, which may exert a specific beneficial effect upon the lungs and air passages, also probable differences in the electrical conditions of the atmosphere and in the amount of ozone in sea air.

6. The sedative influence exerted on the constitution by a comparatively humid atmosphere combined with a high barometric pressure.

7. The bracing and hardening effect of almost constant sea-breezes, and of the changes of climate experienced in passing through the different "regions" of the ocean.

It does not come within the limits of this work to refer to the longer ocean voyages which are made from one continent to another, but rather to the short trips which may be taken along our own shores, or to the islands and other places of resort lying in their vicinity.

#### BRITISH MARITIME PROVINCES.

Very pleasant summer trips of this kind are those to the British Maritime Provinces, which may be made on the several lines of steamers that ply between the ports of these Provinces, such as Halifax and Yarmouth, Nova Scotia, St. Johns, Newfoundland, St. John, New Brunswick, and the more important cities, along the Atlantic sea-board as Charleston, Baltimore, Philadelphia, New York, Boston, Portland and Eastport. Such a trip is not only delightful in itself, but brings the traveller to the cool and pleasant summer climate of these northern lands which we will briefly describe.

*New Brunswick.*—The province of New Brunswick lies

upon the eastern boundary of the State of Maine. Its scenery is diversified by hill, valley, lake and river; much of its area is covered with forests and its waters abound in fish. It is traversed by the St. John River, the largest stream on the Atlantic seaboard between the St. Lawrence and the Mississippi, which has a course of six hundred miles, mostly through forest and farm land, and is navigable for two hundred and twenty-five miles of its length. Very pleasant trips may be made upon this river.

*St. John* situated at its mouth on the Bay of Fundy, is the chief city and sea-port of the Province, having a population of about fifty thousand, and affording comfortable hotel accommodations. Trips across the Bay of Fundy can be made to the celebrated Annapolis valley. The village of *Rothsay* in the vicinity of St. John is a favorite summer resort. *Loch Lomond*, lying eleven miles to the northeast, is likewise much frequented.

*St. Andrews*.—The town of St. Andrews, situated some miles east of St. John, on the Passamaquoddy Bay, opposite Eastport, Maine, is a pretty place with good hotels.

*Campobello Island*.—A few miles below St. Andrews, in the Canadian side of the bay, lies Campobello Island, which is a very delightful place of summer resort. It is nine miles in length and has good beaches, fine scenery and excellent hotels.

*Grand Manan*.—South of this is another island known as the Grand Manan, located at the entrance to the Bay of Fundy. It is about twenty miles in length, and while its western shore presents towering cliffs and peculiar rock formations, its eastern shore is quite different in topography, its outline being formed by coves and beaches, where several villages have sprung up. This island is also

a favorite place of summer resort, particularly frequented by artists. The entertainment is good.

#### NOVA SCOTIA.

The Province of Nova Scotia, the ancient Arcadia, consists of the peninsula bearing that name, lying south-east of New Brunswick, separated from it for nearly its whole extent by the Bay of Fundy, and of Cape Breton Island, at the east end of Nova Scotia proper, but divided from it by the Gut of Canso.

This province, like New Brunswick, is dotted with lakes and streams. The eastern arm of the Bay of Fundy extends into the province from the north. On the southern shore of this inlet, which is known as Minas Basin, lies Grand Pré, the land of Longfellow's "Evangeline."

On another inlet of the bay, some miles to the south-west are the towns of *Annapolis* and *Digby*, points at which the steamers stop.

*Yarmouth*, on the southwest coast, is a flourishing seaport, a pleasant stopping place for tourists.

*Halifax*, the capital of the Province, situated on the southeastern coast, is a fine city with a population of from thirty to forty thousand. This city has many good hotels and is made easily accessible by frequent steamers stopping there, and by railroads across to the Bay of Fundy and to the north and west.

*Pictou*, on the northern coast, in the coal region of the province, is another steamer landing.

#### CAPE BRETON.

The Island of Cape Breton, one hundred miles in length and eighty-five in breadth, is a favorite place of resort, because of its fine scenery, salubrious climate and

excellent sporting facilities. It contains an inland sea, called Bras d'Or, which nearly divides the island into two parts, and upon which very pleasant trips may be made. The chief town on the island is *Sidney*, with good hotels. It has a fine harbor and is a stopping place for steamers.

#### PRINCE EDWARD'S ISLAND.

This fruitful isle lies in the Gulf of St. Lawrence, north of Nova Scotia and east of New Brunswick, and is another place of resort. Its length is about one hundred and forty miles. The coasts present bold, red cliffs from twenty to one hundred feet in height. The climate is salubrious, and cool and delightful in summer, especially during July and August. Its capital and chief centre of trade is *Charlottetown*, once very flourishing, but now a rather quiet place of about nine thousand inhabitants, having convenient quiet hotels. *Summerside*, *Georgetown*, *Souris*, *Tignish*, *Cape Traverse*, *Rustico*, *Malpeque* and other places on the island attract summer visitors, where they find comfortable entertainment, but not with the large hostelrys of some of the cities and towns further south.

#### NEWFOUNDLAND.

The largest island of this region, Newfoundland, lying some miles to the northeast, has a cool, bracing summer climate. The ocean cliffs, and crags of its rock-bound shores are charming to the vision. The summer tourist from the "States" almost imagines when he finds himself in the principal city, *St. Johns*, that he has gone back to the season of spring. However that may be, he is in a pleasant old town, situated on the eastern part of the peninsula of Avalon, with a fine, well protected, placid harbor, surrounded by cliffs which rise to a height of five hundred feet from the sea.



Seal oil, and dried cod fish, and cod liver oil are some of its principal exports. An abundance of game of all kinds is found in Newfoundland. Steamers leave St. Johns frequently for Quebec, Baltimore and New York, also for the the western and northern coasts of Newfoundland; likewise for Labrador. The latter is a beautiful trip upon which the tourist enjoys magnificent rocky scenery and the opportunity of seeing the Esquimau at his home. Other trips may be made from one place to another in the provinces, by means of boat or railroad.

Various short voyages may be made along the Atlantic coast of the United States from one city to another, such as from Norfolk and Newport News, Baltimore, or Philadelphia, to New York; thence through the Long Island Sound to Boston and other places on the New England coast. In colder weather the ocean voyager may travel southward on the various lines of steamers, visiting the many southern winter resorts. Delightful trips may not only be made to such places on our coasts as Old Point Comfort, Charleston, Savannah, Jacksonville, Mobile, and New Orleans, but also to points in Mexico, Central America or the various groups of islands lying in the Southern waters. There are a number of resorts particularly desirable as places of residence during the winter months, located upon these islands which will be briefly alluded to in the following pages.

#### THE BERMUDAS.

This group of small islands lying about five hundred and eighty miles south-south east of Cape Hatteras, constitute the "still vext Bermoothes" of Shakespeare's "Tempest." They are formed upon a coral reef and are in number about three hundred and sixty-five, though collectively they measure only about eighteen miles in length

and six in breadth. The individual islands are separated by channels which are as a rule narrow, but afford good bathing, boating and yachting. Only fifteen or twenty of these islands are inhabited. Their climate is humid and mild, the thermometer seldom rising above eighty-five or falling below forty, the average temperature being seventy degrees Fahrenheit. Vegetation continues during the entire year, flowers and fruit growing in profusion and the scenery is very picturesque.

The largest of the group is Bermuda or Long Island, sixteen miles in length and one and a half in width. The town of *Hamilton*, the capital of the group, is situated on this island. It has a population of about fifteen hundred, and has comfortable hotels and boarding houses. The cottage which the poet Tom Moore occupied and the calabash tree under which he wrote, during his residence in the Bermudas are in the vicinity of the town.

St. George's Island is the second in size ; at its eastern end is *St. George*, which though the largest town, and chief port of the Bermudas, does not afford accommodations equal to those of Hamilton.

#### THE WEST INDIES.

The archipelago lying south-east of Florida and stretching across the entrance of the Gulf of Mexico is called the West Indies. This is a collective name including about one thousand islands and islets which severally represent almost every European power. Their total length is said to be about three thousand miles and their area one hundred and fifty thousand square miles. Their climate varies with the location but it is usually pleasant and salubrious during the winter months ; the flora and fauna are tropical.

They are divided into four groups, the names of

the more important individual islands, appear in the following tabulated list.

|              |   |   |   |   |
|--------------|---|---|---|---|
| WEST INDIES. | { | BAHAMAS.  | { | Grand Bahama.<br>Great Abaco.<br>Little Abaco.<br>Andros.<br>New Providence.<br>Eleuthera.<br>San Salvador.<br>Rum Bay.<br>Great Exuma.<br>Watling Island.<br>Long Island.<br>Crooked Island.<br>Atwood's Key.<br>Great Inagua.<br>Little Inagua. |
|              |   | GREATER ANTILLES.   | { | Cuba.<br>Hayti or San Domingo.<br>Jamaica.<br>Porto Rico.   |
|              |   | LESSER ANTILLES,<br>CARIBBEAN ISLANDS,<br>OR<br>WINDWARD GROUP. | { | St. Kitts.<br>Antigua.<br>Guadaloupe.<br>Dominica.<br>Martinique.<br>St. Lucia.<br>St. Vincent.<br>Barbadoes.<br>Trinidad.  |
|              |   | DUTCH WEST INDIES,<br>OR LEEWARD GROUP.                         | { | Margarita.<br>Tortuga.<br>Buen Ayre.<br>Curacoa.  |

The simple description that follows only refers to those islands that are resorted to for health and pleasure.

#### THE BAHAMAS.

The first group, the Bahamas, lying off the south-east coast of Florida at a distance of about three hundred and fifty miles, are about six hundred in number; of these fifteen are inhabited, with an aggregate of about forty thousand population. The climate is very similar to that of southern Florida, but slightly more equable, and as

the islands are of coral formation, covered with a light sandy soil, they are free from marshy tracts. Their most important place of resort is *Nassau*, situated on the northern side of the island of New Providence, the capital and seat of the government of the group. It is a pretty town, with good hotels and a salubrious winter climate. *Dunmore Town*, on Harbor Island, a few miles from Nassau, is a place of resort which has a very similar genial climate. Turk's Island at the southeast extremity of the group is also somewhat resorted to. Its climate is warmer. Neither of the last named places afford the accommodations that are to be found at Nassau.

#### THE GREATER ANTILLES.

Cuba, the largest and most important of the West Indies, lies between the Caribbean Sea and the Gulf of Mexico, about one hundred and thirty miles south of Florida. It is traversed in almost its entire length, seven hundred and sixty miles, by a range of mountains. The climate is tropical, there being but two seasons, the wet and the dry. The best time to visit this island is between the first of December and the last of March. The vegetation is luxuriant.

*Havana*, the largest city and chief commercial port of the West Indies, is situated on the southwest coast of Cuba on the Gulf of Mexico. This is a beautiful and gay place, as well as furnishing ample hotel entertainment and amusements for its numerous visitors.

*Matanzas*, fifty-three miles east of Havana, is an important city also located on the coast. Its winter climate is rather more salubrious than that of Havana, being mild and even. The city is a desirable winter resort; although the hills back of the city are preferable places of residence for many persons.

*Santiago de Cuba*, the second city in size on the island, is situated at the extreme southwestern part, and is resorted to on account of its warm winter climate, but it is not a healthful location on account of its proximity to marshes and its poor water supply.

*Puerto Principe* is a city situated in the interior of the island. Its winter climate is very mild and free from some of the objectionable features of places along the coast.

The Isle of Pines lies about thirty-three miles off the coast of Cuba, south of Havana. It has a very mild, salubrious climate in winter and one which proves beneficial to some classes of invalids, especially those who feel better in warm weather. The towns on the island are *Nueva Gerona*, *Santa Fe*, and *Jorobado*.

Hayti or Santo Domingo is next in size to Cuba. It is four hundred miles in length, has a good harbor and is traversed by general mountain ranges. During November, December and January this island has a moderate rain-fall, but from February to April the weather is uniformly dry. The island does not afford such good places of resort as others of this group. The most desirable localities lie back among the mountains.

Jamaica lies about ninety miles south of Cuba. Its climate is only suitable for invalids during the months of December, January, February and March, during which time the weather is delightful. *Kingston*, the chief city and capital of the island, is situated on the north coast. It is a pleasant town somewhat resorted to during the winter.

Porto Rico, the most easterly and smallest of the group, has mild equable winters, comparatively free from rain. Its principal town and capital is *San Juan de Porto Rico*, situated on a small island off the northern coast. This place

has a population of about twenty-three thousand and provides suitable entertainment for visitors.

The Virgin Group, lies off the eastern end of Porto Rico. Of these St. Thomas and Santa Cruz or St. Croix have a mild equable winter climate and several places of resort, of which *Charlotte Amalie* on the former, *Christiansted* and *Fredericksted* on the latter, afford the best accommodations.

#### THE LESSER ANTILLES.

“Those leafy isles upon the ocean thrown,  
Like studs of emerald o’er a silver zone.”

This group is crescentic in form, extending from Porto Rico to the mouth of the Orinoco River, (S. A.) It lies between the Atlantic Ocean and the Caribbean Sea. The scenery is fine, being somewhat mountainous in character. The climate is tropical and delightful the first four months of the year. These islands are reached by steamer from New York, in somewhat less than a week’s time.

Dominica and Martinique are the most beautiful of this group. They have bold cliffs and luxuriant tropical vegetation. *Roseau* is the chief town of Dominica and lies between the Caribbean Sea and the high sheltering hills. It affords boarding accommodations. *St. Pierre* is the chief city of Martinique, where hotels are to be found, and a few miles from town are some warm springs which are considerably frequented. *Fort de France* is the seat of government and lies twenty miles north of St. Pierre. There is a statue erected at the former place in honor of the Empress Josephine, who was born on this island. Warm springs are found near the town.

The island of St. Vincent lies to the south. It has a warm, humid climate. *Kingston*, the chief town, is a pleas-



ant place situated on the southwestern coast, and has quite a reputation as a health resort.

Barbadoes, the most easterly of the group, has a mild, salubrious, genial winter climate. There are several chalybeate springs on this island. *Bridgetown*, the capital, has a population of twenty-five thousand, and hotels and boarding houses. The most prominent resorts on the island are *Hastings*, two miles from the capital, and *Bathsheba*, sixteen miles distant.

The island of Trinidad lies further south than the others of this group, being situated at the entrance of the Gulf of Paria, (S. A.,) and consequently has a warmer, more moist climate, while the flora and fauna of the island are truly South American. Its principal city, *Port of Spain*, is a fine place, from which trips may be made to the neighboring islands or to British Guiana, Venezuela and other South American ports.

#### DUTCH WEST INDIES.

The fourth group of West India Islands lies west of the Barbadoes, to the leeward, hence they have received the name, "Leeward Islands." They are located just off the coast of Venezuela.

Curacoa, one of this group, has a hot, dry climate, and if not so far distant from the United States, would probably attract more northern tourists who are in search of health or pleasure. Its capital and principal town is *Willemsted*, situated at the entrance of Santa Anna Harbor, on the southwest coast.

#### ALASKA.

Charming ocean trips may be taken along the Pacific shores of our country; a delightful summer excursion is that from Portland, Or., Tacoma, Seattle or Port Townsend on

Puget Sound; or from Victoria or Nanaimo on Vancouver's Island, British Columbia, to south-eastern Alaska. Regular trips are now made during the summer months by fast steamers and the travel to this distant part of our country is annually increasing. The coolness of the climate and grandeur of the scenery are more easily understood by a summer visit, than here described. As the calm and enjoyable voyage is made through what is called the "inland passage," sheltered by islands lying all along the coast, the traveller beholds arctic scenery at every turn; snow-capped peaks and ranges, ice-clad gorges, fields of glacial ice, outjutting glaciers, and sometimes ice-bergs, which to the inhabitant of temperate regions are as beautiful as they are strange, attracting the eye and engaging the mind in the most restful manner. After the arrival of the tourist in Alaska this interest is fully sustained, for the mining towns, Indian villages and the homes and habits of the natives will afford much entertainment and diversion. This great territory, rich in treasures, good fish and charming scenery, is a wonderful section of country and is as yet but little appreciated by the great majority of Americans. The following brief descriptions of the points at which the steamers stop may be of interest to the reader.

*Fort Tongas.*—Fort Tongas is the guarding point at the lower extremity of the dividing line between British America and Alaska. The fast excursion steamers seldom stop at this place; the smaller ones which carry more or less freight and have very good passenger accommodations, stop at this and all other points, even canneries, where passengers are to be landed or freight is to be discharged.

The Fort is located on an island in front of the harbor, formed by the water ways, which are very narrow, being obstructed by reefs, so that only small vessels can en-

ter with safety. The anchorage is dangerous on account of these reefs, although the harbor waters are quite deep. There are several large Indian villages located on the mainland, which is well wooded and quite level. A tourist, unless he desires a primitive mode of life, would hardly care to stop at this point.

*Fort Wrangell.*—The next place of interest to the tourist is Fort Wrangell, situated at the mouth of the Stickeen or Stikine river. It derives considerable importance from the United States Military post, which was erected here in 1867, on the northern headland near the entrance of the harbor. Baron Wrangell, in 1834, established a stockade post called St. Dionysius, which is now in ruins. Nearly one hundred thousand dollars have been expended in buildings in this locality. The commerce and gold findings amounted to nearly a million of dollars in 1867. In this vicinity is found a greater number of Totem Poles and Indian relics than in any other region, because there are a number of Indian villages in this neighborhood. Here is quite a little town called Wrangell, where a deputy collector of customs lives; also missionary establishments, two churches and a school for the Alaskans. But visitors will be more interested in the curios and carvings on the different poles which are found throughout the village, as well as what is contained in the Indian huts. The Indians have a great many silver and gold rings and ornaments for sale, and for money will part with almost any article laying about their houses or tepees; moreover, they take care to make a thoroughly Yankee bargain in the transaction; they call all white people "Boston men."

All the steamers stop here and remain for several hours, giving tourists a good opportunity to see these primitive people and the articles that they have for sale. Except for

miners or sportsmen there is nothing to tempt a longer delay.

*Juneau.*—Probably the most flourishing place in Alaska, and one with the best prospect of becoming a large city, is the mining town of the above name. It was originally called Harrisburg, but its name was changed in honor of one of the prospectors; the harbor was formerly called Rockwell, after a naval officer. There were two men, Harris and Juneau, who established the first camp at this place. The district was named for the latter, and the town for the former, but the residents being troubled about their mail matter, held a meeting and adopted the latter name for the city, and the United States Government thereupon established a post-office at Juneau. The town is located at the base of a lofty and precipitous range of hills, back of which in the basin adjacent, have been found some very fine gold and silver mines, while others farther back in primeval forests are coming to light, making this a rapidly growing place in which a traveller, notwithstanding meagre hotel accommodations, may spend a few days very pleasantly. A large number of Alaskan curios and northern furs may be found in the stores in this place. The population numbers about two thousand, with Indian villages adjacent.

*Douglas Island.*—Directly across the Gastineau Channel is found the flourishing town of this name. Probably the most extensive gold and silver mine in the world exists at this place. The ores are mingled with galena and iron pyrites. Although it produces a small quantity per ton, the vein is inexhaustible, being in some places about four hundred feet wide and running almost the length of the island. In visiting the mines and stamp mill, we found that there were one hun-

dred and twenty stamps running night and day the year round, and giving an average output of gold of about seventy-five thousand dollars worth per month, and at that time, 1887, the company were talking of doubling their capacity. They were then adding a number of improved furnaces for roasting the ore. Other mining operations have begun there, and it will pay the traveller to lay over a week or two for the next steamer.

*Chilcat and Chilcoot Inlets.*—The excursion steamer will sometimes run up to these most northern points, where there is nothing of interest except the native villages and a missionary post called Haines. The scenery up these channels is sublimely grand. Tall mountains and cliffs loom up on either side with many beautiful cascades and waterfalls, and it is these charming views that call the steamer to this point, for there is no stopping place for tourists until we reach Sitka, unless they choose to camp out.

The steamers pass two of the largest glaciers in Alaska; the Davidson glacier, located on Seduction Islet, which it is claimed has the widest outlet, but it is hidden by a narrow, dense jungle at the base, through which we groped and almost lost our way before we reached the stream which led up beneath the glacier. Some distance to the south, after passing through Glacier Bay, in the waters of which were floating many beautifully tinted ice-bergs, we came in front of one of the finest glacial outlets in the world, for the steamer is able to sail directly up to its base, so that the ice-craggs frown down in majesty upon the seemingly tiny craft. It is said to be three miles in width, and from two to three hundred feet in height, striking the eye of the beholder with amazement at its beautiful ice-cliffs, coves and caverns. The steamer usually



reaches there in the morning and remains until afternoon, to allow visitors time to climb over its crystal peaks and pinnacles and explore the crevasses, and listen to the crumbling ice as it breaks in thunder tones, and plunges down into the deep waters beneath.

*Sitka.*—Sitka, the capital of Alaska, is the rounding point of this delightful voyage, by way of the inland passage. It was formerly called by the Russians, New Archangel, the present name being native, probably derived from a tribe of Alaskans with a similar designation. Count Baranoff, the Russian Governor, founded the town in 1804, after the natives had destroyed the original settlement on Starri-Gavan Bay in 1800. It was the headquarters of the Russian American Company, and has become the chief town of this portion of the country under the United States Government. The town is situated on the eastern portion of Sitka Sound. The steamer usually stops here over a day, and there are two or three small hotels where the tourist will find as fine accommodations as it is possible to obtain in Alaska outside of the cozy vessels.

The town holds a number of objects of interest and there is an Indian village of perhaps a thousand inhabitants, running along close by the shore. There are probably as many more Russians and Americans, together with the troops stationed in the old Baranoff citadel situated at this place. It is the headquarters of the Governorship, Judiciary and the residence of other government officials. The return voyage from this town is sometimes made by a shorter route through the channels, which is equally as enjoyable as that of the out-bound trip.

*Metlah-Kathla.*—Sometimes the steamers will stop at the missionary town of Metlah-Kathla, on the coast of British



America, established by William Duncan about thirty years ago. As you approach it, it appears like a thriving American town with straight avenues and streets ; and as you meander on you will find that most of these frame houses indicate former thrift but are now vacated, the converted and educated Indians having followed Mr. Duncan to an Island in the southern part of Alaska ; large fleet of canoes were just leaving the day that we arrived at the place. The round trip by the fast steamer is accomplished in eleven days, but by smaller ones eighteen or twenty days may be consumed.

Healthful and restful sea-water trips may be made along the Pacific coast from San Francisco northward and up the Columbia river to Portland, or direct to the various ports on Puget Sound, or through the straits of Juan de Fuca on to Nanaimo, Victoria, or Vancouver, B. C., or *vice versa*. Other ocean voyages can be made southward to San Diego or intervening ports from San Francisco. Australia, the Hawaiian Islands and South American ports, can be reached by steamer lines running regularly from the same port.

Occasionally steamers or sailing vessels run north to Behring Sea, to the Seal Islands of St. Paul and St. George and to some of the Aleutian Islands, but there is no regular line.

#### SANDWICH ISLANDS.

A delightful voyage, particularly for the winter months, is that to the Sandwich, or Hawaiian Islands, the most northerly group of the Polynesian Archipelago, which lie in the North Pacific between Mexico and China. There are twelve islands in the cluster having a total area of over six thousand square miles ; two thirds of which is included in the principal island, Hawaii, which gives its name to the group. The other islands are : Maui, Molokini, Kahoolawe,

Lauai, Molokai, Oahu, Kauai, Lehua, Niihau, Kaula and Bird.

The trip from San Francisco has been described as follows:

“The voyage down to the islands lasts from eight to nine days, and even to persons subject to sea-sickness it is likely to be an enjoyable sea-journey, because after the second day the weather is charmingly warm, the breezes usually mild and the skies sunny and clear. In forty-eight hours after you leave the Golden Gate, shawls, overcoats and wraps are discarded; you put on thinner clothing. After breakfast you will like to spread rugs upon the deck and lie in the sun, fanned by deliciously soft breezes, and before you are in Honolulu, even in winter, like to have an awning spread over you to keep off the sun. On the way you see flying fish, and if you are lucky, an occasional whale or a school of porpoises, but no ships. It is one of the loneliest of ocean tracks, for sailing vessels usually steer farther north to catch stronger gales. But you sail over the lovely blue of the Pacific Ocean, which has not only softer gales, but even a different shade of color than the fierce Atlantic.”

The Sandwich Islands are the result of volcanic action and are mountainous in character. On this account the climate varies with the locality; on the windward or eastern coast the rain falls more frequently and abundantly than on the lee side. The chief place of resort is *Honolulu*, the capital of the kingdom, which is situated on the south coast of the island of Oahu, at the base of towering mountains that shelter the town from the trade winds and rain storms. Its population is about fifteen thousand, a large proportion of which consists of foreigners, many of whom are Americans. The hotel accommodations are first-class, and the social advantages superior; the residents being very hospitable, mak-

ing visitors feel most welcome. The climate is mild and equable, the winter range of temperature being from sixty-eight to eighty-one degrees. The annual rain-fall averages about forty-one inches, but is irregular and the moisture quickly disappears, as the soil is porous. The scenery surrounding Honolulu is purely tropical. Pleasant excursions may be made to neighboring places. The mountains in the vicinity are more suitable as a place of residence than the town, during that part of the year between May and September. *Lahaina*, on the island of Maui, and *Hilo*, on the eastern side of the island of Hawaii, are towns that are more or less visited by invalids, but they do not afford such conveniences as are to be found at Honolulu. The former has rather a milder climate than that of Honolulu, while the latter, being on the windward side of the island, has an extremely humid climate, rain falling nearly every day. In the interior of the island of Hawaii is the little town of Waimea, with an equable and comparatively low temperature. It is a place of retreat from the dampness of the shore. A fine line of steamers is running.

#### LAKE TRIPS.

*The Great Lakes.*—Most enjoyable tours may be made during the spring, summer and autumn to and over the waters of the Great Lakes lying on our northern border. These five lakes, Superior, Michigan, Huron, Erie and Ontario, are the largest bodies of fresh water in the world. They are so connected that a continuous journey can be made through their entire length, with but one break which is caused by the great "Falls" of the Niagara river, which stream connects Lakes Erie and Ontario. The longest trip is from Duluth, or Superior city, Minn., at the extreme western part of Lake Superior, to Buffalo, N. Y., at the

foot of Lake Erie, or *vice versa*, a distance of one thousand, two hundred and thirty-five miles, which is accomplished in one week. The places at which landings are made are quite numerous. Those made on the trip down Lake Superior after leaving Duluth are :

Bayfield, Washburn and Ashland, Wis.; Ontonagon, Eagle Harbor, Portage Lake, (Houghton and Hancock) and Marquette, Mich. From the last named place the steamer proceeds to Sault Ste. Marie and passing through the strait which is about sixty miles in length, comes to Lake Huron. In the passage over the waters of the last named lake it makes but one stop, which is at Detroit, Mich. The next landing is at Port Huron, Mich., at the head of the St. Clair river, thence it passes through the lake of the same name to the flourishing and beautiful city of Detroit, from which stopping place it resumes its journey, passing through the Detroit river to Lake Erie, down which it sails to Buffalo, making landings at Sandusky and Cleveland, O., Erie, Pa., and Dunkirk, N. Y.

A trip along the northern shore of Lake Superior is very delightful, starting from Duluth and sailing past the Palisades to Fort William, Ont., thence past Thunder Bay to Red Rock, Ont., and from this place to Sault Ste Marie.

Another trip may be made by starting from Chicago, Ill., at the head of Lake Michigan, stopping at Milwaukee, Wis., thence passing over the entire length of the lake to its foot, through the straits of Mackinaw and down Lake Huron, stopping at Bay City on the way to Port Huron.

A passage may be made over the waters of Georgian Bay (Lake Huron) from Sault Ste Marie to Collingswood, Ont.

A voyage over Lake Ontario is accomplished by starting at Hamilton, Ont. Landings are made at Toronto, Port Hope, Cobourg and Kingston, all of the same province.

This is completed in a little less than twenty-four hours. The journey may be continued from the last stopping place, Kingston, down the St. Lawrence river to Montreal, Quebec and other interesting places.

#### RIVER TRIPS.

In our journeyings by water we must not overlook those to be made upon some of the great rivers of our country.

*The St. Lawrence river.*—This voyage is a very picturesque one. After leaving Kingston the steamer passes through that portion of the river known as the Lake of the Thousand Islands and through it passes along amid lovely islands and islets, stopping at Clayton and Alexandria Bay; thence it proceeds down the river to Ogdensburg, N. Y., and Prescott directly opposite on the Canadian shore. Some miles below these places it passes through the first of the rapids. A number of miles further down the river it comes to Long Sault Rapids, nine miles in length, where the exciting experience of “shooting the rapids” is encountered. At the foot of these rapids the river begins to flow entirely through British soil, where it soon expands into Lake St. Francis. After passing through this the steamer makes its way through more rapids, then into another expansion known as Lake St. Louis, below which comes the great Lachine Rapids, the descent of which is described as “an intense sensation, terrible to the faint-hearted, exhilarating to the brave.” After pursuing its course for nine miles further, the steamer reaches the beautiful city of Montreal, the metropolis of British North America, situated on an island of the same name at the confluence of the Ottawa with the St. Lawrence, the head of ocean steamship navigation. Thence pursuing its course down the river forty-five miles to the town of Sorel, five miles below which place



the steamer passes into the expansion of the stream known as Lake St. Peter, below which it stops at the city of Three Rivers, located at the mouth of the St. Maurice river, and from there proceeds onward down to the historic city of Quebec where the regular tour of the St. Lawrence ends.

The lower river is very interesting and a pleasant trip may be made upon it, thence through the Gulf of St. Lawrence around to Pictou, other points in Nova Scotia, or St. Johns, Newfoundland, or to intermediate stations, and from some of these places, if desired, the voyage may be continued to Portland, Me.

An enjoyable summer excursion may be made from Quebec in one of the splendid steamers to and upon the beautiful *Saguenay River*, the largest tributary of the St. Lawrence, which enters that river one hundred and twenty miles below Quebec. It is navigable for sixty-five miles of its course. The scenery along the river is very bold and charming, the steamer passing between grand precipices which tower up on either side for many miles.

Another of these trips may be made upon an affluent of the St. Lawrence, the *Ottaway*, or *Grand Rivér*, at the mouth of which lies the village of St. Anne, where Tom Moore wrote his beautiful Canadian Boat Song, beginning with the familiar lines :—

Faintly as tolls the evening chime,  
Our voices keep tune and our oars keep time ;  
Soon as the woods on the shore look dim,  
We'll sing at St. Anne's our parting hymn.  
Row, brothers, row, the stream runs fast,  
The rapids are near and the daylight's past."

#### THE HUDSON RIVER.

A wonderfully picturesque though short trip of about twelve hours may be taken night or day on the historic and



noble waters of the Hudson, which has its source among the Adirondack lakes and serves as an outlet for a portion of their waters. It flows amid scenery more or less enchanting, till it enters New York Bay. The section of country through which it wanders is famous in romance and history. Some of the scenes of Cooper's "Last of the Mohegans," are laid at *Glens Falls*, a point about sixty miles north of Albany, where the river rushes through a ravine, making a descent of fifty feet. It is a spot of beauty which is much frequented by summer visitors. Many places along the river are inseparably associated in the mind with the writings of Washington Irving, while others serve as reminders of the days of the Revolution. The banks of the river are dotted with handsome residences and villas, thriving villages, towns and cities, many of which are pleasant and popular summer resorts. We will briefly describe the larger and more important of these places which are passed in coming down the river from Troy to the great metropolis lying at its mouth.

*Albany*, the capital of the Empire State, six miles below Troy, is the first landing the boat makes. *Hudson*, some miles below on the east bank, is a pleasantly situated city of ten thousand inhabitants commanding an extended view of the mountains opposite. *Catskill*, one hundred and fourteen miles from New York, is on the west bank of the river. It is a pretty place and a point of approach to the mountains of the same name. *Hyde Park*, eighty miles from New York on the east bank is also a fine place, more or less frequented in summer.

*Poughkeepsie*, five miles south of the last named town, is the second city in size that we pass; its population being over twenty thousand. It is situated at an elevation of over two hundred feet above the river and is quite an educa-

tional centre. *New Paltz Landing*, just across the river, is connected with Lakes Mohawk and Minnewaska by stage.

*Newburg*, some miles south on the same side of the river, is a city of eighteen thousand inhabitants. It has an elevation of three hundred feet, and has comfortable hotels and boarding places. *Fishkill Landing*, lying on the opposite bank is a small but pretty place.

*Cornwall* is another cosy spot situated on the west bank and much resorted to in summer, as is also *West Point*, a few miles further south where is located the famous national military school. The Highlands occur at this portion of the river's course and extend for sixteen miles southward, some of the peaks attaining an elevation of sixteen hundred feet. *Garrison*, situated about fifty miles from New York, nearly opposite West Point, is a favorite place with summer visitors.

*Peekskill*, is located eight miles south at a bend in the river, in the midst of the finest and most commanding scenery. *Sing Sing* is situated on the east side of that portion of the Hudson known as Tappan Zee, on the Tappan Bay at a distance of thirty-three miles from New York. It is a charming village containing many fine residences. *Tarrytown* is pleasantly situated four miles to the south. This place is intimately associated with Irving's writings. Sleepy Hollow, where his remains are buried, being but a short distance from here. *Nyack* lies on the opposite bank. It is a pretty place located in a hilly region.

*Yonkers*, on the east shore, seventeen miles from New York, is a most delightful town containing many magnificent residences, and is in reality a suburb of the great city so near. For miles above New York, along the abrupt river banks, a great number of costly villas peer out from among forests, terraces, evergreen and summer foliage, adorned

with lawns of greensward, flower beds and many tinted borders and plateaus of artistically arranged plants.

#### MISSISSIPPI RIVER.

The tour of the Mississippi, the great "Father of Waters," is divided into two portions. That upon the upper river extending from St. Paul to St. Louis, and that upon the lower river, from St. Louis to New Orleans. The river is not navigable for the first thousand miles of its course; that is from its source in northern Minnesota, near that of the Red river of the north, to the Falls of St. Anthony at Minneapolis. Below this point its surface is plied with fine steamers which afford excellent fare and good berths and state-rooms. The following are the principal landings made on the descent of the upper river: St. Paul, Hastings, Prescott, Red Wing, Winona, La Crosse, Lansing, Prairie du Chien, Mac Gregor, Dunleith, Dubuque, Galena, Fulton, Clinton, Davenport, Rock Island, Muscatine, Burlington, Nauvoo, Keokuk, Quincy, Hannibal, Louisiana, Alton and St. Louis. The scenery of the upper river is very beautiful as far as Alton, below which point it resembles that of the lower river, which is dismal and unattractive. The stopping places between St. Louis and New Orleans are: Cape Girardeau, Cairo, Columbus, New Madrid, Memphis, Helena, White River, Napoleon, Young's Point, Vicksburg, Natchez, Red River, Bayou Sara, Port Hudson, Baton Rouge, Plaquemine, and Donaldsonville.

#### THE OHIO RIVER.

The largest affluent of the Mississippi is the Ohio river which joins it at Cairo, after a course of one thousand miles, which is navigable throughout from its formation at Pittsburg by the union of the Alleghany and the Monongahela rivers. The scenery along the river is never grand but it

is often quite fine. From Pittsburg to Wheeling, the trip is made upon packets ; from the latter point in large and comfortable steamers to Cincinnati, from which place fine steamers run down the river to Cairo. When the waters are high large steamboats of the flat-bottom style in use upon the western rivers, can ascend the Alleghany for a long distance at least as far as Franklin, and also up the Monongahela as far as Brownsville, Pennsylvania.

#### THE COLUMBIA RIVER.

In the extreme Northwest we find the beautiful Columbia river which is navigable, except at its rapids, for about one thousand miles of its course. The scenery of the lower two hundred miles is famous. This includes the Dalles and Cascades, where the river forces its way through the Cascade Mountains and runs for a distance of fifty miles between precipitous walls of stone and mountains. This portion of the river is not navigable, but a pleasant trip may be made from Portland, Or., on the Willamette river down to Astoria, near the mouth of the river, or up to the Dalles, a distance of about one hundred and twenty miles, where a train may be taken at two different points around the obstructions and the trip resumed up the river, through more or less inspiring scenery, to Wallula, about two hundred and forty-five miles from Portland.

Quite a number of short excursions can be made upon the smaller craft that ascend such rivers as the Red, the Tennessee, the James, the Missouri, the St. Johns and a number of others in various parts of the country. These, however, have a local reputation only, and are suitable usually for those who reside in cities or towns on their banks, or individuals who may be visiting near them.

## CHAPTER VII.

### MINERAL SPRINGS.

Medicinal Value known to the Ancients—Climate of the Locality—Classification—Mineral Springs of the United States—Therapeutics.

The custom of employing the waters of mineral springs for medicinal purposes is universal, prevailing among the people of savage as well as civilized nations, and it has been so in all ages. The ancients were familiar with the medicinal properties of the waters of some of the now most famous and popular spas, which were in many cases, the sites of temples. Their waters were then, as now, highly prized as medicaments and were used internally or in the form of baths. Until a comparatively recent date each spring or fountain was supposed to be presided over by a deity or spirit, through whose instrumentality cures were effected, and many fanciful legends grew out of this belief.

Probably many of the mineral springs of our own country were known and used by the Aborigines. As early as the fourteenth century, the High Rock of the Saratoga Springs was frequented by the Mohawk Indians and called by them "The Medicine Spring of the Great Spirit." There are about three thousand localities in the United States where mineral springs are known to exist, while the number of individual springs is three times as great; at many of the spas there are a number of springs which greatly vary in composition and properties. More than six hundred of these localities have been developed as health resorts. The location of a spring is a matter of importance, for undoubtedly



much of the benefit accruing from a residence at the various spas, arises from the climate and surroundings, such as: altitude, temperature, atmospheric conditions, scenery, outdoor exercise, sanitary and hygienic surroundings, nutritious food, pleasant amusements, congenial company, and other similar circumstances; hence these adjuncts should be carefully considered in choosing such a place for the restoration of health.

The actual value of mineral waters as therapeutic agents independent of the surroundings, has been a much mooted question; but there can be no doubt that they possess medicinal virtue, varying in kind and degree with the ingredients of the waters. These ingredients are, in many of the mineral waters, similar to the constituent salts and gases of the human body, and exist in a form which can be readily appropriated by the tissues; moreover in many cases they stimulate the depuratory organs, skin, liver and intestines, to increased secretion. But had these waters no medicinal value, the course of treatment pursued at most of the spas must affect the patient suffering from a chronic dyscrasia, such as rheumatism, syphilis, or scrofula, in a favorable manner, as the frequent, long continued, thermal baths and ingestion of unusually large quantities of water, thoroughly drench the system with that fluid, which must rapidly displace the water constituting two thirds of the human organism, and cause pronounced tissue metamorphosis, and produce changes in the system in a few weeks, which under ordinary conditions would require years to accomplish.

It is needless to state that great care should be exercised in the employment of mineral waters; when they are advised, the prescriber should be familiar with their chemical constituents, therapeutic properties and the applicability of the individual spring to the individual case, and carefully



direct as to the quantity, as well as the mode and time of use.

Objection has been made to the use of mineral waters on the ground of polypharmacy, because of the multiplicity of their constituent elements, but in answer to this it has been suggested that the same is true of many of the medicinal substances of organic origin, so commonly employed in medicine. Again, it has been claimed that the waters are, in many cases, used empirically, their exact ingredients being unknown or the mode of their action not well understood, but this is a plea that might with equal force be brought against many accepted medical procedures.

Mineral springs are variously classified; the best classification for medical purposes is the chemical, which specifies a spring-water as belonging to a class indicated by the ingredient which is most abundant or most active, as alkaline, saline, sulphur, chalybeate, calcic, sulphated, and simply thermal. Many springs produce waters which possess the properties of two of these classes, and are termed accordingly, alkaline-chalybeate, saline-sulphur, thermal-calcic, and so on.

*Alkaline.*—The waters of this class are rich in alkaline carbonates, the chief of which is the carbonate of soda; they usually contain a quantity of carbonic-acid gas. The use of the alkaline waters is generally considered by the medical profession to be indicated in catarrhal affections of the respiratory, digestive and genito-urinary organs; in uric acid, diathesis; malarial cachexia; and diabetes mellitus. The following are some of the springs of this class, found in the United States: Sheldon Springs, Franklin County, Vt., Welden Spring, St. Albans, of the same state and county; Orkney Springs, Shenandoah County and Rockbridge Baths, Rockbridge County, Va.; Capon Springs,

Hampshire County, W. Va. ; Bladen Springs, Choctaw County, Ala. ; St. Louis Spring, Gratiot County, Mich. ; Congress Springs, Santa Clara County, and Borax Springs, Lake County, Cal.

*Saline.*—The chlorides are the chief constituents of these waters, the chloride of sodium predominating ; traces of iodine and bromine are sometimes found. The saline waters are considered to be valuable in the treatment of scrofula, syphilis, chronic gout, hepatic disorders, malarial cachexia and cutaneous and catarrhal affections.

The famous Saratoga Springs of New York belong to this class, as do also the Ballston Spa, Saratoga County, of the same State. Michigan Congress Spring at Lansing, the capital of Michigan. Spring Lake Well and Fruit Port Well, Ottawa County, also of Michigan, are well-known spas of this variety.

*Sulphur.*—In these waters the sulphur is in the form of sulphurets, the most prevalent and active being the sulphuret of hydrogen ; this gas imparts its peculiar odor and taste to the water. Sulphur waters have been found particularly useful in correcting bad habits of the body, arising from chronic poisoning, as from metals, or specific animal poisons. They are also employed in treating chronic engorgement of the liver and its accompanying symptoms, catarrhal affections of the respiratory tract and diseases of the skin.

A number of springs of this class are found in the Alleghany and Blue Ridge regions. In Virginia are the Yellow Sulphur Springs, Montgomery County ; Grayson Sulphur Springs, Carroll County ; Jordan's White Sulphur Springs, Frederick County ; White Sulphur Springs, Montgomery County ; Huguenot Springs, Powhatan County ; and Buffalo Springs, Mecklenburg County. In West Virginia

the Greenbrier White Sulphur Springs, Greenbrier County; Salt Sulphur Springs and Red Sulphur Springs, Monroe County; and in Pennsylvania, York Sulphur Springs, Adams County; Carlisle Springs, Cumberland County; and Minnequa Springs, Bradford County, are noted sulphur springs.

The Green-cove Springs of Clay County, Florida, is a spring of this class much visited in winter. In Kentucky there are a number of sulphur springs: the Upper and Lower Blue Lick Springs, Nicholas County; Louisville Artesian Well, at Louisville; Grayson Springs, Grayson County; Paroquet Springs, Bullitt County, and Big Bone Springs, Boone County. In New York State are found the Sharon Springs, Schoharie County; Avon Springs, Livingston County; Clifton Springs, Ontario County; Richfield Springs, Otsego County and Massena Springs, St. Lawrence County. The Alpena Well at Alpena, Michigan, is exceedingly rich in sulphuretted hydrogen. There are some valuable springs of this class in Indiana; of these the French Lick Springs and West Baden Springs of Orange County; Indian Springs in Marten County; Lodi Artesian Well, Wabash County, and Lafayette Well, Tippecanoe County, are the most important. Near Sitka, Alaska, there are two thermal sulphur springs, which are much prized by the Russians and Indians who inhabit that region.

*Chalybeate.*—In these waters the chief or most active ingredient is iron; many of them are highly charged with carbonic acid gas which renders them more palatable and efficacious. The ferruginous waters are particularly indicated where there is a deficiency in the red elements of the blood, in cases of anæmia, chlorosis and reduced states of the system. The following are some of the best springs of this variety found in the United States: Rawley

Springs, Rockingham County, Sweet Chalybeate Springs, Alleghany County, Rockbridge Alum Springs, Rockbridge County, and Bedford Alum Springs of Bedford County, Virginia; Montvale Springs, Blount County, Tennessee; Cooper's Well, Hinds County, and Ocean Springs, Jackson County, Mississippi; Oak Orchard Acid Springs, Orleans County, and Sharon Springs, Schoharie County, New York; and Schooley Mountain Springs, Morris County, New Jersey.

*Calcic.*—In these waters the salts of lime form the most important ingredients. They occur most frequently as the sulphate (gypsum) or the carbonate (limestone). The waters of these springs are useful in the treatment of dyspepsia and chronic cystitis with tendency to the formation of stone or gravel. Such of these waters as contain an abundance of the alkaline carbonates have proved of value in treating diabetes mellitus. Some of the more important spas of this class are the following: Butterworth Springs, Kent County; Eaton Rapid's Wells, Eaton County, and Leslie Well, Leslie County, Michigan; Clarendon Springs, Rutland County, Vermont; Yellow Springs, Green County, Ohio; Gettysburg Springs, Adams County, Pennsylvania; Sweet Springs, Monroe County, and Berkely Springs, Morgan County, West Virginia; and the Alleghany Springs, Montgomery County, Virginia.

*Sulphated.*—In these waters the sulphates predominate; the sulphate of sodium (Glauber Salt) or the sulphate of magnesium (Epsom Salt) impart the bitter taste and purgative properties which characterize the waters. Good examples of this class of mineral springs are: Estill Springs, Estill County, and Crab-orchard Springs, Lincoln County, Kentucky, and Bedford Springs, Bedford County, Pennsylvania.

*Thermal.*—The value of this class of waters depends more upon their temperature, which ranges from 85° Fahrenheit upward, than upon the presence of any particular chemical agent, although they may in that respect come under the several classifications above considered. They are employed, as a rule, in the form of baths, and have for this purpose the advantage over artificially-heated water, in that the temperature of all portions of the water is uniform and remains the same during the bath in the large natural pools found at many of the springs. These baths may, according to the needs of the case, be tepid (85° to 92° Fahrenheit), warm (92° to 98°) or hot (98° or above). They may last from fifteen minutes to an hour or more; may be taken every day or less frequently, and continued from a few weeks to several months. Thermal waters are particularly indicated in the treatment of chronic rheumatism and gout with contractions and stiffness of the joints; secondary and tertiary specific complaints; paralysis and such diseases of the skin as psoriasis and lichen.

The following are some of the most valuable of the springs of this variety; Lebanon Springs, Columbia County, New York; Hot Springs, Warm Springs and Health Springs of Bath County, Virginia; Warm Springs, Meriwether County, Georgia; Warm Springs, Madison County, North Carolina; Las Vegas Hot Springs, San Miguel County, New Mexico; Idaho Hot Springs, Clear Creek County, and Middle Park Hot Springs, Grand County, Colorado, and Salt Lake Hot Springs, Salt Lake County, Utah. The Yellowstone Park, Wyoming Territory, contains thousands of springs, mostly calcic and silicious; their temperature varies from 160° to 200° Fahrenheit. In addition to these springs, there are about fifty geysers,



which throw a column of water from fifty to two hundred feet in height. The waters of some of these thermal springs are employed for baths. Others of this class are : Hot Springs, Garland County, Arkansas ; Calistoga Hot Springs, Napa County ; The Geysers, Sonoma County, Paso Robles Hot Springs, San Luis Obispo County, and Santa Barbara Hot Springs, Santa Barbara County, California.

Mineral waters are cautiously prescribed for children and aged persons, also during gestation, and particularly in cases of organic disease of the heart, or other organs. When the water of a certain spring is selected as suitable for a case, it is the custom of the prescribing physician to advise that its use be persisted in and not changed for the water of another spring, as patients are not benefitted by vacillating from spring to spring. When mineral springs are visited it is, as a rule, best to obtain local medical advice.

The length of time the resident physicians at the springs usually suggest for treatment, varies from three weeks to as many months. When it is desired to overcome a morbid habit of the body, they generally consider it necessary for the patient to return to the spring several successive seasons for treatment.

When the water is employed for internal use it should be taken moderately and slowly ; the stomach should not be overfilled. Frequently the patient is advised to take a pint or a pint and a half before breakfast, allowing fifteen or twenty minutes to elapse between drinking each glass and the same quantity in like manner before supper.

The temperature of these draughts of water may vary, but if too cold (below 50° Fahrenheit), it is not so readily absorbed as when warmer. Experience has proven that it is not necessary to produce a disturbance of the system



or aggravation of the existing symptoms to effect an improvement. Should such a condition result from the use of the waters, they should be discontinued or the quantity employed diminished. While the treatment is being pursued, the diet should be plain, nutritious and free from excesses, and as far as possible the mind should be free from all care and anxiety. The food as well as the medicinal waters should be taken at regular definite hours and in special quantities fixed by rule. Many who seek restoration at mineral springs, have become invalids through the nervous and mental strain incident to business cares and responsibilities, as well as from the general custom of many men in hurrying through their meals and in drinking fluids too rapidly.

When such an one sets out to recover his health it is necessary to observe the requirements laid down in works on the subject of Dietetics, and to live a life of thorough regularity.

Medical men selecting springs for their clientele should use the same care in individualizing the symptoms of the case and adapting the latter to the special spring suitable thereto. For instance, spring water that would help a scrofulus diathesis might not benefit a rheumatic or gouty patient, while a spring water that might cure a case of renal disease might seriously impair one where hepatic or cardiac symptoms are present. Then again an individual with anæmia might require the prescription of drinking water that would contain properties calculated to improve the condition of the blood, and this might not be a mineral spring that would be of advantage to one suffering from a skin disease or a chronic ulceration.

## CHAPTER VIII.

### SUMMER RESORTS.

Location and Latitude—Resorts of British America—Alaska—The Atlantic Sea-board—The Great Lakes—The Great Northwest—The Pacific Coast.

The first consideration of a suitable place of summer resort, is a cool, or moderately cool, temperature, and a location where there are daily air movements or currents combined with the other well-known healthful climatic and sanitary conditions, among which we would particularly emphasize purity of the air. For such places, it is natural to look to the northern section of our country, where, in fact, the majority of hot-weather retreats are located; but we must also remember that the temperature of a place depends not only upon its latitude, but also upon its altitude, distance from the sea, and other circumstances. Hence we frequently find locations, having a delightful summer climate, much nearer the equator than would otherwise seem possible.

Another desirable feature in regard to such a place is, that it should be so located as to afford not only beauty of scenery, but also have much to attract, in the way of outdoor amusement and sport. Consequently, most of our summering places are found among the mountains, beside the sea, or near some body of fresh water. As all places, of any note, so located, have been referred to in preceding chapters, it will be merely necessary in the case of many now under consideration to mention them by name, without entering upon any extended or particular description with regard to them.

During the past half century the resources of the United States have been wonderfully developed in this direction. Each great city has its suburban villas and neighboring places of retreat from the urban heat, unsanitary streets and unpleasantness of the summer ; but these can scarcely be classed among the summer resorts we are here noting. Many of these latter have merely a local popularity, while others attract visitors from all portions of the land.

These havens of retreat from the hot unhealthful atmosphere of towns and large cities, are of inestimable value in the prevention of disease and the preservation of life. They afford the overtaxed an opportunity to lay aside the cares of business and social life for a time. Some of these places allow ample means, if one so desires, to return to the natural and primitive customs of out-door life, of which our higher civilization has so largely deprived us.

The naming of any special limits of latitude regarding the location of summer resorts, is of necessity, more or less arbitrary ; however, we find the majority of such in this country lying between the fortieth and fiftieth degrees of north latitude, a region including the British Maritime Provinces ; New England ; a portion of the Atlantic sea-board inclusive of the northern half of the New Jersey coast ; the Great Lakes ; the lake-regions of New York, Ontario, Wisconsin and Minnesota ; and that truly remarkable portion of the United States known as the Great Northwest or "Wonderland."

Other regions more or less frequented during the heated term, but lying north or south of the parallels named, are the Red river and Lake Winnipeg districts of Manitoba and vicinity, and the Alaskan Territory ; while those lying south of the lower limiting parallel are : the Atlantic sea-board of Southern New Jersey, Delaware and

vicinity, inclusive of Chesapeake Bay ; portions of the Alleghany and Rocky ranges ; and the Pacific coast neighboring San Francisco and stretching southward below that city.

When one desires to visit a certain suitable resort, it may be necessary for him to take a long journey by rail or water to reach the locality ; but as traveling does not involve the endurance of the hardships it did in days gone by, and as in many cases such a trip simply means residence for a few days or a week in a moving palace, the journey in itself may prove a source of benefit. Indeed, it so frequently does, as the traveler enjoys not only a change of climate but an accompanying change of scene, that we attach high value to such trips for many people. A visit by one residing in the "States" to a point in Canada or Alaska necessitates a journey of this kind.

*British Maritime Provinces.*—Special mention has already been made of the British Maritime Provinces ; for this reason we will simply enumerate the most popular places therein, beginning at the eastern limit and proceeding to the westward. These are : *St. Johns*, Newfoundland, *Sidney*, Cape Breton Island ; *Charlottetown*, Prince Edward's Island ; *Pictou*, *Halifax* and *Annapolis*, Nova Scotia ; and *St. John*, New Brunswick.

*Muskoka District.*—In the Province of Ontario, north of Lake Ontario and east of Georgian Bay, is what is known as the Muskoka District or the "Highlands of Ontario." This comprises a group of some eight hundred lakes of all sizes, connected by streams. One of the largest and most beautiful of this group is Lake Muskoka, twenty-two miles in length. Its surface is dotted with several hundred islands, and thriving villages are located on its banks. This region is much resorted to during the summer, and is

probably one of the best places on the continent for fishing, hunting and camping. Its most important towns are: *Bracebridge*, *Muskoka Wharf*, *Beaumaris*, *Port Carling* and *Port Rosseau*; the hotels located at these places, and at other points in this district, afford good accommodations.

*Manitoba*.—In the Province of Manitoba and the surrounding territory we find the grand system of lakes and streams to which the Red River of the North, and Lake Winnipeg belong. This also is a fine region for hunting and fishing.

*British Columbia*.—The Province of British Columbia separates the Territory of Alaska from the United States. The capital and chief city, *Victoria*, attracts more summer visitors than any other portion of the Province. It is located on Vancouver's Island at the south-western extremity of the British Possessions; the city has a population of about eleven thousand, affords good hotels and is a point from which trips along the Pacific coast may be made.

*Alaska*.—The places of interest to tourists in Alaska, "The Land of the Midnight Sun," have already been mentioned. The chief of these is *Sitka*, situated on the beautiful Baranoff Island, one of Alaska's Thousand Islands. This town is the capital of the Territory and has a population of about twelve hundred. Its climate is comparatively mild and humid, the mean temperature being about 44° Fahrenheit, the thermometer seldom falling to the freezing point; the annual rain-fall varies from 65 to 90 inches, as it rains from 200 to 285 days in the year. Mineral springs in the neighborhood of the town are esteemed of much value by the Indians and Russians of the vicinity.

*New England*.—Within the limits of the United States probably no region of equal area contains so many places for summering as New England. It has well been said:



"There is scarcely a village or hamlet in New England or the Middle States, twenty miles distant from a city, that is not more or less visited in summer, and to that extent a 'summer resort.' " This popularity of New England during the heated term is chiefly due to its generally pleasant summer climate; also in part to its great extent of picturesque sea-coast, with excellent beaches and off-lying sea-washed islands; and its attractive mountains

"That like giants stand,  
To sentinel enchanted land."

The individual places of resort found in this region have been described in preceding chapters; hence at this point we need simply to recapitulate the names of the most important. Along the coast are: *Eastport, Bar Harbor*, (Mt. Desert Island), *Bath, Casco Bay, Old Orchard Beach, York Beach, New Castle, Isles of Shoals, Rye Beach, Hampton Beach, Gloucester Beach, Marblehead, Swampscott, Nantucket, Martha's Vineyard, Newport, Narragansett Pier and Block Island*.

The mountainous regions attract many summer visitors by their pleasant climate and scenery. Among the White Mountains of New Hampshire are the villages of *North Conway* and *Gorham*, pleasant places of retreat, and several large hotels are also situated at different points in the mountains. The principal places of resort in the Green Mountains of Vermont are: *Montpelier, Stowe* and *Rutland*. Those among the Berkshire Hills of Massachusetts are: *Great Barrington, Stockbridge, Lenox, Pittsfield, North Adams* and *Williamstown*. Other attractive places during the warm season in this region are: *Moosehead Lake* and the *Rangely or Androscoggin Lakes* of Maine; and *Lake Winnepesaukee* of New Hampshire.

*Atlantic Sea-board*.—Although the summer climate of that



portion of the Atlantic Coast south of the region just described is not equal in coolness or salubrity to that of New England, still many charming places are found along the shores of Long Island, New Jersey and Chesapeake Bay. The most important of those on the New Jersey coast are : *Long Branch, Asbury Park, Spring Lake, Atlantic City, and Cape May.* On Chesapeake Bay we find *Old Point Comfort, Newport News,* and many other smaller places, principally visited, during the summer months, by residents of the southern states and in winter by northern people.

The most popular mountain resorts of that portion of the Atlantic Highland, lying south of New England, are such villages as *Saranac, Keene* and *Elizabethtown,* and the individual hotels located in the vicinity of a number of the lakes among the Adirondacks of New York State ; the villages of *Catskill, Palenville, Cairo* and *Phoenicia,* and hotels at various points in the Catskill Mountains of the same State ; *Delaware Water Gap, Mauch Chunk, Cresson,* and many other places among the Alleghanies of Pennsylvania; and *Asheville* in the heart of the Piedmont Country, which consists of the mountainous region of North Carolina and the adjoining parts of South Carolina, Tennessee and Georgia.

In New York State there are a number of summer resorts located upon the shores or in the neighborhood of bodies of fresh water, as: *Lakes Champlain, George, Oneida, Cayuga, Seneca, Canandaigua, Keuka* and *Chautauqua.* A number of pleasant health retreats have sprung up about some of the mineral springs in the State, the most important of which is *Saratoga,* located about one hundred and eighty miles from New York City; it has a resident population of about eleven thousand, which increases to thirty thousand during "the season." The

springs, which are of the saline variety, attract visitors from all parts of the country. The hotel accommodations are first class. Some of the other spas of New York State are: *Richfield Springs*, *Sharon Springs*, *Clifton Springs*, *Balston Spa*, *Lebanon Springs* and *Massena Springs*. Pleasant places for summer residence are found all along the banks of the beautiful Hudson.

*The Great Lakes.*—The Canadian and United States shores of the Great Lakes are dotted with summer resorts. At the foot of Lake Ontario are the *Thousand Islands*; on the Canadian shore are *Kingston*, *Toronto* and *Hamilton*. On the southern shore are *Sackett's Harbor*, *Henderson Harbor*, *Lake View*, *Ontario Beach*, *Lakeside* and *Olcott*. Between Lakes Ontario and Erie are *Niagara Falls*. Near the head of Lake Erie is *Lakeside*, a pleasant place, a few miles from which are the *Put-in-Bay Islands*. On the St. Clair river, near Lake Huron, is the village of *St. Clair*, a favorite spot. On the shores of Georgian Bay (Lake Huron) we find *Parry Sound* and a number of other pleasant places. At the head of Lake Huron is the beautiful *Island of Macinac*, a charming summer resort. On the shores of Lake Michigan are *Petoskey*, *Charlevoix*, *Traverse City*, *Grand Haven*, *Highland Park*, *Lake Forest*, *Lake Bluffs*, *Waukegan*, *Sheboygan*, *Manitowoc*. On Green Bay are: *Menominee*, *Marinette*, and *Green Bay*. On the shores of Lake Superior are: *Au Train*, *Marquette*, *Ashland*, and *Superior*. These lake resorts are referred to at greater length in another chapter.

Many delightful retreats are found among the lake regions of Michigan, Wisconsin and Minnesota; these are described in the chapter before mentioned.

*The Rocky Mountains.*—In the Rocky Mountains there are many enjoyable places; of these we might mention the

*Natural Parks, Colorado Springs, Idaho Springs, and Manitou Springs*, of Colorado, and *Santa Fe* and *Las Vegas* of New Mexico.

In the extreme north-western corner of Wyoming Territory is the novel and curious geyser and warm spring region, known as the *Yellowstone National Park*, a delightful place to visit. Much might be written about it, but it should be seen to be appreciated fully.

In Utah a pleasant summer spot is *Garfield Beach*, at the southern extremity of Great Salt Lake; another pleasant place is *Utah Hot Springs*, situated about nine miles north of Ogden.

*The Northwest.*—Though that section of the United States known as the Northwest cannot boast of the number of highly developed places of resort found in the older portions of our country, it contains many which will in time come to be justly famous in that capacity. In Idaho we find the *Soda Springs* at an elevation of five thousand seven hundred and seventy-nine feet above the sea-level; situated in a pleasant locality, in the south-eastern portion of the Territory, in the midst of a fine hunting country; which has a pleasant summer climate and comfortable hotels.

Some miles to the southwest are the *Great Shoshone Falls* of the Snake river. Some miles to the north we find the *Guyer Hot Springs*, a beautiful mountain resort, two miles from the attractive town of *Ketchum*, which is prettily situated at the head of the Wood river valley. The northern portion of the territory is mountainous and covered with forest, which affords excellent sport, while fine fishing is enjoyed in *Lakes Pend d'Oreille, Cœur d'Alene* and *Cocohla*, and entertainment can be had at the towns on their shores and in their vicinity.

In Oregon, at the Dalles of the Columbia river, is *Dalles*

*City*, an attractive place, situated in the midst of splendid scenery. *Portland*, on the Willamette river, fifteen miles from the Columbia, though not a summer resort, is beautifully situated amid the Cascade Mountains. From this city a fine view may be obtained of such towering peaks as Mts. Hood, Jefferson, Adams, St. Helens and Tacoma. *Astoria* is situated near the mouth of the Columbia river, where it is joined by Young's river. This town has a population of about six thousand. It is quite a place of summer resort with persons from the interior; its hotels are good.

In the eastern portion of Washington Territory are the *Spokane Falls*, formed by the waters of the river of the same name. The town of Spokane Falls has a population of about twelve thousand, and affords comfortable hotel accommodations. It is situated in a fine section of country for hunting and fishing, and is destined to be a large city. Sixteen miles southwest is a pleasant resort known as *Medical Lake*.

On Puget Sound are several places which attract summer visitors, such as *Olympia*, *Seattle*, *Tacoma*, *Port Townsend* and *Whatcom*. The waters of the sound afford yachting, boating and fishing; and the surrounding country good hunting. The climate is pleasant and the scenery very fine, as the sound lies between the Cascade Mountains on the east and the Olympian Range on the west.

*Pacific Coast*.—On the Pacific coast are many charming summer resorts. The more important of these are *Iluaco*, *Clatsop Beach*, *San Rafael*, *Santa Cruz*, *Monterey*, *Pacific Grove*, *Santa Barbara*, *Santa Monica*, *San Diego* and *Coronado Beach*. The most southerly of these are open to visitors during the entire year.

## CHAPTER IX.

### WINTER RESORTS.

Intermediate Resorts — Resorts of Minnesota — Southern States — Southern California.

The rigorous winters and trying weather of the early spring months in the northern sections of our country make it desirable and advisable for many invalids, as well as a goodly proportion of the feebler persons of the community, to seek at that time a retreat under sunny southern skies amid mild and congenial climatic surroundings.

In addition to places which are suitable for the residence of this class, during the winter months, there is a middle ground, containing what might be termed Intermediate Resorts which are especially adaptable for spring and autumn. These are very desirable as stopping places for the northern invalid on his return home in the spring from his winter retreat. There is much danger, as a rule for him, if he comes north in the early spring, before the mild weather is well established.

#### MINNESOTA.

Contradictory as it may seem, for at least one class of sufferers, Minnesota lays claim to being a place of winter resort. The central, southern and eastern portions of the state which have an altitude of about twelve hundred feet above the level of the sea, have a cold, clear, dry climate which is suitable for some cases of phthisis, particularly where the disease is in its incipient stage. The principal places of resort are: *St. Paul*, the capital of the



state, a fine city, with superior hotels, situated on the banks of the Mississippi river. Ten miles above, on this mighty stream, we find *Minneapolis*, located at a point in the river where St. Anthony's Falls occur; its situation is less protected than that of St. Paul, but it is nevertheless as flourishing a city and is much frequented, and has very excellent hotels. *Red Wing*, forty miles below St. Paul, and *Frontenac*, fifty-one miles below, are situated on the expansion of the Mississippi river known as Lake Pepin; they are sheltered by hills, afford comfortable entertainment, and are in all respects pleasant places to visit during both summer and winter. *Winona*, situated one hundred miles below St. Paul, on the Mississippi, is sheltered by high bluffs along the river, and has good hotels. *Fairbault* is an interior town about fifty miles south of St. Paul; it has all the characteristics of a desirable Minnesota winter climate and resting place.

#### SOUTHERN RESORTS.

Along the Atlantic sea-board we find a number of winter health-stations, the more northern of which, properly speaking, should be called Intermediate Resorts. In the pine regions of New Jersey is a place known as *Lakewood*, its name being a hint of the topography of its surroundings, having two lakes which are situated in the woods that encircle the town, and are miles in extent. This place, though new as a winter retreat, is of some local importance. It is easy of access to New York, and has a first-class hotel and appointments, every arrangement being made for the comfort of winter guests. Its temperature at that season generally registers ten degrees higher than that of New York. Its location amid the pine growth, and the soil being light and sandy renders the air somewhat

dry, while the balsamic emanations from the forests make it pleasant and healthful. *Brown's Mills*, also situated in New Jersey's pine belt, is a similar retreat, where one may enjoy the fragrance of the pine forests. Travelling southward, we find other places of this class.

*Southern Pines, N. C.*, is situated near the centre of the state, about fifty miles south of Raleigh, on a sandy ridge; the air is impregnated with the perfume of the yellow pine. The hotels at this place are comfortable.

*Camden, S. C.*, lies in a section known as the "Sand Hills," in the central part of the state, "the veritable home of the long-leaf pine; the atmosphere, which is saturated with the resinous exhalations of its immense forests, is of the purest and most invigorating character." Driving, riding and fox-hunting are some of the amusements the place affords visitors, who are well cared for in the way of entertainment.

*Summerville, S. C.*, is a small town situated amid the pine woods. Its winter climate is mild, equable and healthful; and its boarding accommodations are suitable for invalids and the healthy alike.

*Aiken, S. C.*, is a popular resort, situated in the southwestern portion of the state, on a sandy plateau about six hundred feet above sea-level. The strata underlying the sand is gravel, so that after a rainy day the walks are dry again in a few hours. The atmosphere is pure, moderately dry and saturated with the balsamic properties of the pine forest. The winter climate is mild and genial; and the hotels, sanitarium and boarding places are numerous.

*Augusta, Ga.*, about seventeen miles from Aiken, has a somewhat similar climate. It is a beautiful place situated on the banks of the Savannah river, two hundred and thirty miles from its mouth. It has ample and good hotels.

The section of the State of Georgia lying south of Augusta, Macon and Columbus, and in from the coast, has a light, sandy soil, which is heavily timbered with pine. A similar tract is found in the southern part of Alabama. *Thomasville*, Ga., is situated in what is regarded as the most desirable portion of this pine region. It is a pretty town of about five thousand inhabitants, situated at an elevation of three hundred and thirty feet above sea-level. Its hotels are good.

The health stations along the coast we shall simply name, as they have been previously spoken of at some length. On the New Jersey coast are *Atlantic City* and *Cape May*, these are open during the entire year. Their winter temperature is somewhat higher than that of other places of the same latitude, as the Gulf Stream comes nearer the shore in their vicinity than elsewhere. On Chesapeake Bay are *Old Point Comfort* and *Newport News*, Va. Farther south are *Charleston*, S. C.; *Savannah*, Ga.; strictly speaking this beautiful city with its intermediate climate is not on the coast, but upon the river of the same name, eighteen miles from its mouth, its winter atmosphere is mild, genial and equable; *Brunswick*, Ga., (Brunswick-by-the-Sea as it has been rechristened), *Fernandina*, *Pablo Beach* and *St. Augustine*, Fla.

There are many wintering places among the islands lying in the southern waters, most important of them are: *Hamilton*, in the Bermudas; *Nassau*, in the Bahamas; *Havana*, Cuba; *Kingston*, Jamaica; and *Bridgetown*, Barbadoes.

A number of cold weather retreats are found in Florida. This state has a mild, sedative, humid, equable, winter climate; numerous lakes and rivers, pine forests and a great extent of sea coast. *Jacksonville*, the largest city of the State, is situated on the St. Johns River, twenty-five miles from its mouth. Its resident population is about twenty-six

thousand, which is largely increased during the winter season. Desirable accommodations are to be found in and about this pleasant southern city.

*Palatka*, seventy-five miles up the river, is situated upon a fine, high plateau. Its resident population is about five thousand, but during the winter it becomes that of a good sized city; tourists and invalids are well cared for here.

*Welaka* is quite as pleasant a place, twenty-five miles further up the river. *Sanford* is situated at the head of the steamboat navigation, on Lake Monroe, and is the metropolis of Southern Florida. It is a comfortable stopping place.

*Enterprise*, on the opposite side of the lake, is a favorite spot; its climate is warmer than that of Jacksonville. The hotel accommodations are all that could be wished for.

South of Enterprise is an excellent hunting and fishing region among the forests, lakes, lagoons and bayous. Favorite places in this lake region are: *Winter Park, Orlando, Kissimmee City, Barstow* and *Lakeland*. There are several places of resort on Indian river, a large lagoon or arm of the sea on the east coast; of these the most important is *Titusville*. On Halifax river, another lagoon, north of Indian river, are *Daytona, New Britain* and *Port Orange*.

The most important health places on the Gulf coast are *Key West, Tampa, Cedar Keys, Appalachicola* and *Pensacola*.

Middle Florida differs from the rest of the state; its surface is hilly, and the vegetation, though abundant, is less tropical in character. *Tallahassee*, the capital of the state, is pleasantly situated on high ground. Lakes Bradford, Jackson and Lafayette are in the immediate vicinity. The hotels are not so large as at some other Florida localities but they are good.

*Quincy*, twenty-four miles west, is a mountain village. *Monticello* and *Madison*, respectively thirty-three and fifty-five miles east of Tallahassee, are pleasantly located, and afford good board for visitors. The latter is near the Suwanee river and not far from the beautiful group of lakes, whose individual names are Rachel, Mary, Francis and Cherry, and whose waters abound in fish. Some miles to the south-east are *Waldo*, *Lake City* and *Gainesville*, desirable places, located amid the pine woods, which afford good entertainment.

*De Funiak Springs*, in Western Florida, is a popular wintering place. It is a circular lake or spring without visible source of supply or outlet. Guests are well cared for at this place, where the "Florida Chautauqua" holds its sessions from February till April.

Some miles west of Pensacola is the beautiful city of *Mobile*, Ala., situated at the mouth of the Mobile river. It has a mild, equable winter climate and all needful hotel appointments.

Texas, the "Lone Star State," the largest in the Union, presents a variety in climate which corresponds to its extended area. Along the Gulf coast the climate is mild and humid, the most important places here being *Galveston*, *Indianola*, and *Corpus Christi*. The climate grows dryer as we travel westward through the state. *Austin* lies in what is called the "Health Belt," among the foot hills of the Colorado Mountains. Its population is about twenty-five thousand; its hotels are excellent. *San Antonio*, a few miles to the south-west, has a pleasant winter and early spring climate. There is much in the city and its vicinity to interest visitors. Its population is about forty thousand; and visitors are made very comfortable. In the extreme western part of the state, on the Rio Grande, on the Mex-



ican border, is the town of *El Paso*. This place which has a dry climate, an altitude of three thousand seven hundred and sixty feet above the level of the sea, and an average annual rain-fall of but eleven inches, is a suitable and pleasant winter resort.

There are some places among the Rocky Mountains of Arizona, New Mexico and Colorado which are suitable as winter resorts; these are at a moderate altitude and in a sheltered position. *Santa Fe*, N. M., *Denver*, *Pueblo*, *Las Animas*, and *Trinidad*, Col., are some of the most desirable places of this kind.

#### SOUTHERN CALIFORNIA.

A number of delightful places for a residence during the bleak season of the year are found in Southern California. Properly speaking, this region includes the five southern counties of the state, namely: Santa Barbara, Ventura, Los Angeles, San Bernardino and San Diego, which cover an area nearly as large as the whole of New England. Although California has two seasons, a wet and a dry, this section may be said to have but spring and summer. The wet season does not amount to any serious annoyance so far south, and the winter climate is that of spring. The average annual rainfall is about sixteen inches.

"The climate resembles in general character that of Italy, but has not its objectionable effects of depriving the people of the disposition and power of energetic mental and physical exercise. The *dolce far niente* of Southern Italy, is unknown in California." Its climate surpasses that of the famous resorts of the Riviera in the matter of dryness and equability; it is par excellence the chief of the salubrious localities of this country. No enervating heat, and no torpor-producing cold is ever felt; but a genial, healthful cli-

matic influence prevails the year round. The regulator of the temperature is the Kuro-Siwo or Japan current of the Pacific Ocean, which is estimated to be a mile deep and five hundred miles wide off the California coast, and which never varies more than three degrees from its standard, fifty-six degrees. This great body of water is sufficient to exert a warm influence in winter and a cooling influence in summer. The great interior deserts of California and Arizona doubtless aid in rendering the atmosphere dryer than it might otherwise be in an ocean-bordered country.

The climate of this favored region is mild, moderately dry, equable and salubrious. The scenery is very attractive, presenting verdure clad mountains and plateaus towering thousands of feet above the sea-level, separated by fertile valleys wherein a diversity of production is possible, the cereals, fruits and shrubs of the temperate regions growing side by side with tropical plants and trees. The fruits which are found in the greatest abundance are the orange, grape, lime, lemon, pomegranate, olive, fig, citron, guava, banana, and many others of a semi-tropical nature. Flowers are in great variety, and blossom throughout the entire year. Some of the most desirable health-stations found in this beautiful country will be briefly described.

*Santa Barbara*, in the county of the same name, is one of the oldest and best known of California's health resorts. It is located on the coast, about two hundred and seventy-five miles southeast of San Francisco, in a sheltered position, mountain ranges shutting off the cold northwest winds, and has a fine beach. This town has grown out of an old Spanish mission; its present population is about six thousand, half of which consists of persons from the Eastern States. The hotels are excellent. The climate is very mild and equable. A few miles from the town, among

the mountains, are the Montecito Hot Sulphur Springs, which have an altitude of fifteen hundred feet and afford hotel accommodations for those who desire to try the medical virtues of these thermal waters.

*San Buenaventura*, of Ventura County, is located on the coast, twenty-seven miles below Santa Barbara, at the foot of the Santa Clara and San Buenaventura valleys. Its scenery, which embraces mountain, valley and ocean, is very picturesque. Its population is three thousand and the accommodations for visitors are very comfortable.

*Los Angeles*, one hundred and ten miles from Santa Barbara, in the county of Los Angeles on a river of the same name, is the metropolis of Southern California. Its population is estimated to be about seventy thousand. It lies in a valley sheltered by surrounding mountains, escaping the winds that are felt along the coast. It is the centre of the orange trade; the valley is adorned by orange and lemon groves and vineyards; its hotels are exceptionally good. The most beautiful suburb of the city is *Pasadena*, which is situated in the highest, most fruitful and picturesque part of the great San Gabriel Valley, having an altitude of five hundred feet greater than that of Los Angeles; it is a popular and fashionable resort, with well appointed first-class hotels. *Santa Monica* and *Long Beach* are seaside resorts easy of access from Los Angeles, with desirable hotel accommodations.

About sixty miles east of Los Angeles is the town of *San Bernardino*, in the county of the same name, beautifully situated in a valley producing all the fruits of this region, above which Mount San Bernardino, the highest peak of the Coast Range, grandly towers. This is a favorite inland resort having a dryer atmosphere than most of the places on the coast. Its hotels are very fine. *Coulton*

and *Riverside* are beautiful places in the vicinity, which afford ample entertainment for visitors.

*San Diego*, a prosperous city as well as a favorite health-station, is the capital of the county of the same name. It lies on the coast, four hundred and sixty miles southeast of San Francisco, and fifteen miles from the Mexican border. It has the finest harbor on the coast south of San Francisco. Its population is about twenty-five thousand; its hotels are first-class. Its climate is remarkably dry, mild and equable.

The spring-like winter months suit many an invalid who seeks this spot for recuperation, or recovery from protracted chronic diseases. For a long while the town did not grow very rapidly, but within the last six or eight years it has rapidly increased in population and business thrift, and it is constantly filled with health-seekers and tourists.

One mile across the San Diego Bay, situated on a tongue of land which forms the bay and separates it from the ocean, is the new and lovely resort known as *Coronado Beach*. This is a beautiful crescent-shaped beach, similar to Cape May, on the Atlantic coast. It is six miles long, of hard sand, and affords excellent bathing throughout the year. The climate is that of perpetual spring. One of the finest and largest first-class hotels on the Pacific coast, rivaling the palatial establishment at St. Augustine, Florida, has recently been erected and completed, with every convenience the most fastidious tourist might desire, while the surrounding adornments are the most beautiful, and of a tropical character. The whole peninsula on which Coronado Beach is located was a barren waste three years ago. Now it is becoming a place of beauty and it is annually assuming more and more attractiveness, and when all the ornamental portions are finished, it will be quite like an earthly paradise as well as a resort for health.

## CHAPTER X.

### THERAPEUTICS.

Effect of Climate—Out-door Exercise—Pulmonary Phthisis—Catarrhal Affections of the Respiratory Organs—Asthma—Hay Fever—Neurasthenia—Debility—Rheumatism—Bright's Disease—Hepatic Disorders—Scrofulous Affections—Malarial Dyscrasia.

So great is the impression made upon the human organism by climatic influences that the sentiment expressed in the words—"Das Klima ist der Mensch,"—may be said to be an axiomatical truth. Hence it is, that many pathological conditions are directly produced and others aggravated by such influences, while on the other hand many diseases may be entirely dispelled, and others of an incurable nature so modified, as to symptoms and progress, that the life of the invalid is prolonged in comparative comfort for a considerable period, sometimes for years. Hippocrates said that in chronic diseases, to change the locality was of much advantage. A modern writer on the subject says: "What climate chiefly does is to establish constitutional tendencies through molecular modifications which become permanent and morbid if its warnings are disregarded or opposed, but are often therapeutic and curative when intelligently comformed to and heeded."

A desirable climate is one in which a large proportion of the time may be spent in the open air, in amusements and exercise, such as driving, riding, walking, gunning, fishing, boating, bathing, yachting, or botanizing, which occupy the mind pleasantly, while the physical exercise, if used wisely and in moderation will stimulate the functions of the



respiratory and digestive organs and skin, and prove generally beneficial in effect. It has been estimated that when one walks, at the sea-level, at the rate of three miles an hour, he inspires three times as much air as when in a state of rest. Dryden, realizing the value of out-door exercise said :

“ Better to hunt in fields for health unbought,  
Than fee a doctor for a nauseous draught ;  
The wise for cure on exercise depend ;  
God never made His work for man to mend.”

This quotation suggests another aspect of the subject, namely: That residence in a suitable climate is an important factor in the practice of preventive medicine. One scarcely appreciated as yet, but whose value will be more and more recognized as time proceeds, and we realize that it becomes the high calling of the physician to prevent the development of a morbid process in the organism, rather than to permit it to develop and then attempt its cure.

However, when a diseased condition exists, it is a matter of extreme importance that the climate in which the invalid resides should be well suited to his individual case, and that where a change in the same is necessary, it should be made at a period in the progress of his disease when there is a reasonable hope of recovery or improvement. It requires considerable acumen and diagnostic skill to untangle the network of symptoms present in some cases, and to understand the nature and importance of such at a sufficiently early stage in their progressive course, to decide upon a change of climate at a period when it may prove of real benefit to the sufferer. An equal degree of discrimination is necessary to arrive at a conclusion as to whether the disease has reached a stage too far advanced for climatic help. If so, it is much better for the invalid to remain at home, spending the last weeks or months of his life in

comparative ease, and decidedly more comfort than he could derive from a trip, to a more or less distant health resort, which would entail upon him mental and physical weariness if not suffering.

It has been truly said that "the trance-dream of the invalid is a climate of uniform temperature ; and in search of it he examines the claims of all the four continents and the five zones of the earth to find that it nowhere exists." With equal force another writer states : "There is something wrong with the reasoning powers of an author who jumbles together climatic attributes so that his 'ideal climate' has no real counterpart among the known climates of the world." In short, an "ideal climate" has no existence outside of the imagination of those who desire it. Nevertheless, though each climate has its own peculiar disadvantages, many are sufficiently salubrious for all practical purposes ; and we are inclined to think that such climatic conditions are as often found in our own country as elsewhere.

All persons suffering from the same malady will not be benefitted by the same climate ; choice of locality must vary with the temperament and physical state of the patient, the stage of his disease and the season of the year. We are not to forget the very important fact that the simple change from one climate to another produces in almost every individual a train of symptoms which constitute "acclimatization ;" the milder the process of becoming acclimated the better, of course, it will be for any one who is seriously ill.

The question which now presents itself is : What cases are benefitted by change of climate, and where shall such cases be sent ?

We do not attempt to give an exhaustive answer, but

briefly mention in the following pages some of the more important facts which this question brings out.

#### PULMONARY PHTHISIS.

Probably there is no condition for which the benefits of climate are so often prescribed and sought as in the case of that dread malady, the ravaging enemy of the human race, and the accompaniment of its higher grades of civilization—Pulmonary Phthisis. In many cases where there is a predisposition to this condition, or where the disease exists in its incipient stage, its development may be prevented by giving the sufferers the benefit of a favorable climate, one which will afford them pure air, good electrical conditions, freedom from high winds, a comfortable temperature, and plenty of sunshine, so that the greater part of the time may be spent out of doors. Since it is through the action of the inspired air, or rather of the oxygen contained therein, that the tissue changes, formative or destructive, which occur continually in the animal organism, are carried on, it is a matter of importance that respiration should be supported under conditions which have the fewest disadvantages. Localities suitable for such cases are numerous, varying as they needs must with the peculiar requirements of each case and the season of the year. A cool climate should be chosen for the summer, so that the invalid may be spared the prostration incident to extreme heat; while the winter should be spent in a place where out-door pleasures and exercise may be freely enjoyed.

It has been the writer's experience that in the majority of cases a dry climate is desirable, and as a rule one not having a very high range of atmospheric temperature; to these conditions may be added (for the patient not suffering from hæmoptysis or feeble heart) that lessened barometric

pressure obtainable in high altitudes. In short, we believe that a pure, clear, dry, cool, rarified atmosphere with good electrical conditions and plenty of sunshine, is desirable for most phthisical cases.

Purity of the atmosphere, which consists in freedom from dust, smoke, germs, etc., is one of the essentials of any climate for lung diseases. The purity of the air is greater in high altitudes where the temperature is cool and variable, than in a mild, moist, equable climate.

Clearness or transparency of the atmosphere, is a proof of its purity, also of its freedom from moisture; this is a peculiarity of the air of high altitudes, and accounts for the apparent nearness of distant objects.

Dryness of the atmosphere causes a marked increase in lung excretion or the transpiration of aqueous vapor from the lungs. This renders the separation of carbonic acid easier and stimulates an absorption of catarrhal and other inflammatory products in the lungs. This property of the inspired air combined with coldness is opposed to the propagation of germ-life in the lungs, which requires heat and moisture for the support of its vitality. In dry climates the variability of the temperature range is greater than in moist climates; but "it is the humidity of the air, which, through conduction of the heat from the body, makes a slight temperature change, with the air near saturation, equivalent to a much greater change with the air dry." The variability of temperature in altitudes has a stimulating influence upon one living there, also a purifying effect upon the air; "this happens through the alternate expansion by heat and the contraction of the air by cold, together with the nightly chilling and sometimes freezing, which regularly renders it inimical to germ-life."

Coolness or cold is an element in the climate of high

altitudes, the temperature decreasing at the rate of one degree for every three hundred feet of elevation; it is here associated with dryness; moist cold is not desirable for enfeebled lungs. A dry, cool or cold atmosphere has a stimulating effect upon the organism; it increases lung evaporation and lung expansion, as cold inspired air increases in volume in the lungs, on account of the higher temperature of the body, and expands those organs to their fullest extent.

Rarity of the atmosphere accompanies the lessened barometric pressure which obtains at altitudes. This pressure, which is equivalent to fifteen pounds to the square inch at the sea-level, decreases at the rate of one pound for every two thousand feet of elevation; consequently the atmosphere at an altitude of six thousand feet is one-fifth rarefied. As a result of this, a volume of air contains more oxygen at the sea-level than an equal volume does at an altitude; hence, in the latter situation, an increased volume of air must be inspired in order to obtain the necessary amount of oxygen. This gives rise to an increased action of the lungs and heart; respiration is accelerated and deepened. For some cases of phthisis this is a desirable condition, while for those suffering from the disease in its advanced stages, where there is much softening of the lung tissue, there is more or less danger of hemorrhage from the increased force and frequency of respiration. It has been decided that the preferable altitude ranges in the United States from fifteen hundred feet in the north, in winter, to ten thousand feet in the south, in summer.

The electrical conditions are favorable in altitudes; one writer on the subject of mountainous resorts says: "The changes in the atmosphere in consonance with the variability



of temperature of high climates, are in no small degree electrical. There is an increase of electrical tension and an easier and more frequent interchange between the positive electricity of the dry air, and the negative quality of the ground and of the clouds, so that the condition is decidedly stimulating. This quality, in mountainous sections, is associated with light showers, especially in summer time, when most needed to clear the atmosphere. The simultaneous whirl of a light, rapid wind, often seen in high altitudes, purifies by its substitution of an unused and fresh supply of air for that which is contaminated."

Sunshine in abundance is a desirable factor in climate, as it permits out-door exercise, stimulating to the spirits as well as to the physical functions.

In support of the claims made for the climate of high altitudes, for phthisical cases, we would refer to the success which has attended the treatment of the disease in the Sanitaria established at various points (Davos, St. Moritz, Wiesen, Maloja, and others), among the Swiss Alps, where, for years past, invalids have spent the winter months, devoting a large part of their time each day to exercise in the open air. In further support of the claims made for mountainous resorts for this class of invalids, it has been most justly stated that it is but reasonable to consider the climatic conditions under which phthisis seldom or never occurs, as suitable for its treatment when it has originated elsewhere. The altitude of approximate immunity from phthisis in the United States has been estimated to be at an elevation of about eight thousand feet in the south-western part of the country, to an elevation of about four thousand feet at the northern border.

In winter the higher altitudes are not so comfortable for the invalid as the medium or lower elevations, the cold

being more intense than at the sea-level; for though the heat of the sun is greater, it has less power to warm the air, on account of the diathermancy of the latter.

As a rule invalids suffering from organic diseases of the heart and great vessels, emphysema of the lungs, acute inflammation of the lungs, or great involvement of lung tissue with extensive softening, do well to avoid the higher altitudes; in case of weak heart the approach to the elevated region should be cautiously and slowly made.

In selecting mountain resorts for phthisical cases, places having a sheltered location should be given the preference. In the summer months these sufferers may find suitable places among the White, Green or Adirondack Mountains; the Alleghanies in the region of *Asheville*, N. C., are also desirable. But the best resorts of this kind are found among the Rocky Mountains; the most important of these are in Colorado, where the range attains its greatest height. *Colorado Springs*, *Idaho Springs*, *Manitou Springs*, *Pagosa Springs*, *Pueblo*, *Denver*, and many other places in Colorado might be mentioned as suitable. In New Mexico many excellent places are found among the mountains; of these probably *Santa Fe* and *Las Vegas* are most frequented.

Young persons with a hereditary tendency to phthisis or with the disease in its incipient form, frequently derive much benefit from out-door life, such as ranching, or cattle-raising, in these regions, where the general elevation is thousands of feet above the sea-level, where the heat is never sultry, and phthisis is unknown, except as occurring in persons who have contracted the disease elsewhere.

Phthisical cases, for whom the climate of higher altitudes is not suitable, are frequently benefitted by other climatic conditions.

A warm dry climate is especially to be recommended for cases at an advanced stage of the disease, where suppurative inflammation exists, as such an atmosphere facilitates the healing process. Such a climate is found in *Western Texas, New Mexico, Arizona*, and the interior of *Southern California*. Recently, attention has been called to a depression in the eastern part of San Diego County, California, known as *San Felipe Sink* or *Conchilla Valley*. This basin is about one hundred and thirty miles in length, and attains a depth of about three hundred and sixty feet below the sea-level at its greatest point of depression. The air here is hot, dry and compressed and is claimed to be suitable for some cases of phthisis, which certainly seems very reasonable, as compressed air is highly esteemed in the treatment of that disease. The principal stopping places in this valley are *Indio* and *Salton*. The shores of the Dead Sea in Syria are about twelve hundred feet below the Mediterranean Sea level, giving greater depression by far than of the Conchilla valley, and a man of means has already established a sanitarium in that distant land so difficult of access for the treatment of lung troubles.

A mild and moderately dry climate is well adapted for some phthisical cases ; such a climate is found in Southern California amid the most delightful surroundings ; of all the charming places of resort in this region, perhaps *San Diego* and *Coronado Beach*, deserve to be mentioned first ; but *Santa Barbara, Los Angeles, San Bernardino* and *San Luis Obispo* follow in quick succession, and many others present themselves for notice. A mild and somewhat dry climate is also found among the pine regions of North and South Carolina and Georgia. The sandy soil of these districts is well suited to cases of this kind ; a clay soil which retains moisture being most unsuitable for this class of

invalids. The balsamic exhalations from pine forests, if not curative are at least soothing to diseased lungs. *Aiken*, S. C., and *Thomasville*, Ga., are pleasant resorts of this kind.

A mild and moist climate, characterized by a soft and sedative atmosphere, is suitable for some of the more advanced cases of the disease, as well as those in which there is considerable acute inflammation, indicated by a dry cough, accelerated pulse and general feverishness. The climate of *Florida*, the *West Indies*, and *Hawaiian Islands* is of this variety. The Floridian resorts are numerous, of which *Fernandina*, *St. Augustine*, and *Jacksonville* are the most popular. In the West Indies are *Nassau*, in the Bahamas; *Havana*, Cuba; *Kingston*, Jamaica; *Bridgetown*, Barbadoes, all much frequented. *Honolulu* is the chief place of resort in the Hawaiian Islands.

A cold and moderately dry climate has a tonic, bracing effect, and is desirable in some cases of incipient phthisis; also in some cases subject to hæmoptysis, for hemorrhage is less apt to occur in such a climate than in a more relaxing one. The south-eastern portion of Minnesota has a winter climate of this description. The general altitude of this region is twelve hundred feet. *St. Paul* and *Minneapolis* are the principal places of resort, though some of the smaller towns have an equally suitable climate.

Sea-side and ocean climate is often beneficial in its effect upon phthisis, particularly in the earlier stages of the malady. Repeated ocean voyages is a climatic prescription of great antiquity, but one which is as a rule contra-indicated when there exists a condition of acute inflammation or much of a tendency to hæmoptysis. The seaside resorts most suitable for phthisical cases during summer months, are those on the coast of Maine, New Hampshire, Massachusetts and Rhode Island, and the neighboring islands. The

most important of these are : *Eastport, Mt. Desert Island, Old Orchard Beach, Me ; Isles of Shoals, Rye Beach, N. H. ; Swampscott Beach, Manchester Beach, Humpton Beach, Nantucket and Martha's Vineyard, Mass. ; Newport, Narragansett Pier, and Block Island, R. I.* For the winter, the resorts of Florida and the ocean islands already mentioned, are most suitable.

When a sufferer from phthisis has found a climate suitable for his individual case, and repaired to it, he should remain, if not permanently, which is the best plan as a rule, at least until his health is well established, and after leaving should he notice a return of his lung difficulty go back at once to the favorable climatic conditions. If this desirable climate is prescribed by his attending physician the prescription should be accompanied by a letter of introduction to a reliable physician at the place of resort, which communication should contain information in regard to the patient, the history of his malady, past treatment, and other guiding points in the case.

From considerable observation we are persuaded that as a rule, cases of pulmonary phthisis, that have reached the last stage of the disease, reap longer life, enjoy more comforts, obtain more kindly care, and suffer less, by a continuance at their home, if it be a comfortable one, than they do by a residence at an invalid resort, no matter how near at hand the locality may be. Not infrequently, where a number of such cases are stopping at the same hotel, they will greatly annoy each other ; disturbing their rest at night by coughing, and add to each other's discomfort during the day by gloomy and depressing conversation.

#### CATARRHAL AFFECTIONS OF THE RESPIRATORY ORGANS.

Chronic nasal, pharyngeal and bronchial catarrhal inflammations are often favorably influenced by a change of climate.



Some cases are benefitted by the dry, rare atmosphere of high altitudes which stimulate the absorption of inflammatory products. Other cases are relieved by having recourse to sulphur and saline mineral springs. Sea-air is especially applicable in some cases, particularly to those having a cough accompanied with considerable expectoration. The soothing and somewhat dry atmosphere of pine forests is very helpful to certain sufferers of this class.

#### ASTHMA.

Few conditions are more favorably influenced by climate than asthma; but it is a malady presenting so many forms and personal idiosyncrasies that no definite rule can be laid down as to climate. Sometimes relief is experienced as the result of removal to a climate quite opposite in its characteristics to that in which the trouble originated, as for instance, changing from a moist to a dry atmosphere, or from an inland to a sea-side place of residence, and so on. Some cases, many in fact, are benefitted by residence in a high altitude, others by sea voyages; many suffer less while residing in towns where the air is comparatively dry, deficient in oxygen and overcharged with carbonic acid. Dampness in many cases excites the paroxysms of oppression.

#### HAY FEVER.

Sufferers, from the recurrent periodical attacks of this perplexing malady, are often much, if not wholly relieved by repairing to mountains or sea-side. On the supposition that these attacks are excited by the pollen of plants with which the air is impregnated in localities which abound in vegetation, it is suggested that the sea-side places suitable for such cases, should be protected toward the land by elevations or hills, and have a tendency to sea-breezes. Invest-

igation has proven a singular immunity from this trouble in *Southern California* ; and marked relief if not complete cure of those who have repaired to that region. The *White Mountains* are mostly resorted to, *Bethlehem* being the meeting place of the "American Hay Fever Association." Places of resort among the *Rockies* are very favorable to the relief of this trouble.

#### NEURASTHENIA.

The sufferers from this sadly common complaint, characterized by debility or impaired activity of the nerves, form a large proportion of the invalids who seek relief in a change of climate. In most cases where this condition is not complicated with any other malady, but is simply the result of overwork, excessive mental strain, and fatigue, worriment or confinement to business, mere absence from these wearying causes of mental and bodily discomfort, combined with change of scene and rest, is sufficient to enable nature to react, the nervous system to rebound, the physical and mental functions to regain their equilibrium, and recovery to follow. Consequently the climatic conditions are not of so much importance as in some other cases. The process of acclimatization which follows any decided change of climate, with its attendant physical disturbances, may produce the most radical change for the better, in the neurasthenic invalid. Mountain, seashore, and in fact all kinds of resorts have proved beneficial to such cases. Any of the trips, described in previous chapters, upon salt or fresh water, may be helpful, at least they will afford entertainment and amusement, with change of scene, and tend to divert the over-worked, melancholic, or brain-fagged sufferers from thoughts about themselves, a matter of vital importance in the recovery of such cases.

## DEBILITY.

This trouble, as one writer has said, "though not in itself a distinct disease, is nevertheless a very definite condition." Probably it is more frequently due to anæmia than to any other cause, and is found in the over-taxed, the rapidly growing youth, the convalescent, and others. The same climatic conditions which prove of benefit to the neurasthenic invalid, will apply to the one suffering from debility, the tonic, invigorating air of mountain and sea usually proving most beneficial. The waters of some mineral springs are sometimes used in the treatment of such cases. The chalybeate waters are generally preferred when anæmia is the cause of the condition, those waters being chosen which, on account of additional constituents, are suitable to the cure of the causes which have induced the anæmia.

## RHEUMATISM.

The chronic rheumatic invalid needs a climate free from sudden changes of temperature, high winds, and dampness; one with an abundance of sunshine, a sandy soil, and a mild atmosphere, in short—perpetual spring. Such a climate cannot be found in any one place during the entire year, the nearest approach to it exists in Southern California. Some cases are benefitted by residing at the sea-shore, others at the thermal springs. Mountain resorts, at high altitudes, are as a rule, unsuitable for rheumatic cases.

## BRIGHT'S DISEASE.

Much the same climate is desirable for sufferers from this as from the last named condition; a mild, dry climate, free from sudden changes, especially sudden depressions of temperature in winter in cold climates. Persons suffering from this disease should avoid cold northern winters.

## HEPATIC DISORDERS.

Invalids suffering from disorders of this kind should not reside in low marshy districts, having a moist, warm climate. Residence at mountainous resorts and saline and sulphur springs are suitable for them.

## SCROFULOUS AFFECTIONS.

Sea-air is most beneficial to sufferers with disorders of this class, as enjoyed either at the seashore or upon the ocean. Saline mineral waters (strongly charged with chloride of sodium), are also helpful, when used internally and in the form of baths.

## MALARIAL DYSCRASIA.

The bracing tonic air of the sea and mountain is suitable for chronic malarial troubles. The use of alkaline and saline mineral waters is also beneficial in the treatment of this cachexia.

It seems fitting to sum up this whole subject in the comprehensive and conclusive words of a well-known writer on Climatology, which are as follows: "After all that has been stated of the effects of the atmosphere in high altitudes, or at the level of the sea, the influence of forests and ocean, of sea-coasts and interior places, humidity and dryness, cold and heat, the winds, electricity and ozone, and no matter of what other conditions, the paramount consideration for the promotion of health are, *an abundance of pure air, sunshine and out-door exercise*. Without these no climate is promotive of health or propitious for the cure of disease, and with them, it is safe to say, the human powers of accommodation are such that it is difficult to distinguish the peculiarities of any climate by their joint results on the health and longevity of its subjects."

## CHAPTER XI.

### MEXICO AND SOUTH AMERICA.

Mexico—Natural and Historical Attractions—Climate—Places of Resort—  
South America—Mountainous Resorts.

There is a growing tendency on the part of Americans to visit Mexico during the winter season ; this increases as the railroad facilities improve. Although the hotels are not so numerous or commodious as those of the United States, comfortable accommodations may be obtained in some places. French and Spanish are the languages usually spoken at the inns. “ Mexico, the land of mystery and romance, will in the future be the resort of the valetudinarian, the pleasure-seeker, the tourist, the student, the artist and the speculator. No portion of the Western Hemisphere offers so many attractions for a short tour, or presents so wide a field for the acquisition of curious and scientific information. In her colossal pyramids and in the sculptured ruins of massive temples and palaces, antedating the dawn of veritable history, the archæologist will find ample material for investigation. Comprising, as Mexico does, every variety of climate, and consequently producing every plant which is found between the equator and the north pole, the botanist no less than the general observer will delight in her matchless and gorgeous flora. Nowhere else, on the face of the globe, can the ornithologist or the entomologist find, within a given space, so much to engage his attention. The beauty of her plains, gilded by an eternal summer ; the grandeur of her volcanoes,



lifting their heads for thousands of feet into the region of eternal snow and ice; the endless variety of her stupendous mountain ranges, her lovely lakes, and fertile valleys, all seen through an atmosphere of wonderful transparency—all these, while they will furnish incomparable subjects for the easel of the painter, will forever live in the memory of every lover of Nature who may behold them. The memorials of an extinct religious worship cannot fail deeply to interest the theologian, while the national archives in the capital are full of instruction for the historian and the ecclesiastical student."

Mexico consists mostly of an elevated plateau, having an average altitude of six thousand feet. The country is divided into three zones which differ from each other in their altitude and consequently in temperature. Geographers disagree as to their exact limits, but roughly speaking, the *tierra caliente* (or hot region) includes all that territory having an elevation of less than four thousand feet; the *tierra templada* (or temperate region) between that and seven thousand; the *tierra fria* (or cold region) all over seven thousand. The last named zone includes about half the surface of the country. The climate of Mexico presents great variety; the atmosphere of the plateau is very rare and dry. The rainy season varies slightly in the different parts of the country, but always occurs in summer.

The Republic of Mexico consists of twenty-seven States, one Territory and one Federal District. This country may be reached by rail from the United States or by steamer. Its principal seaport is *Vera Cruz*, an uninteresting and unhealthy place for the tourist, for whom it is not a suitable stopping point, the climate being unusually hot as the city is built on an arid plain. The stranger does well to push inland at once to *Jalapa*, sixty miles distant, or *Cordoba* or

*Orizaba*, situated at about the same distance from Vera Cruz, where he will be wise to remain several days till his lungs become somewhat accustomed to the rarefied air before he proceeds to the table-land. *Puebla* is a pleasant town lying about an equal distance from Orizaba and the City of Mexico; it has a climate similar to that of the latter place being situated on a fertile plain at an elevation of 7,201 feet. To the west is the noted volcano of Popocatepetl (17,735 feet) which well repays a visit. *The City of Mexico*, the capital of the Republic, is a beautiful place and has been called the Venice of the New World. It is situated upon the Anahuac, an extensive plateau having an altitude of from six to eight thousand feet. There are six lakes in the neighborhood of the City, five of which are salt. The climate is trying to the unacclimated; the temperature varies but little between summer and winter, the annual average is 62° Fahr., but the daily range is considerable, sometimes varying from 30° to 75° Fahr. The air is very dry and rare.

In Central Mexico there are several towns which have more or less interest for visitors, of these the most important are: *Querétaro* (one hundred and fifty miles from the capital), *Guanajuata*, *Guadalajara*, *Zacatecas* and *Aguascalientes*. The latter place derives its name from the numerous thermal springs in its vicinity, to which invalids resort considerably.

The Republic may be entered on the north by rail either at Laredo, Eagle Pass or El Paso, towns on the Rio Grande river. About one hundred and seventy miles from Laredo is the city of *Monterey*, which has a large American element, and is something of a winter resort with invalids, its climate being warm, dry and healthful. It is on the isothermal line which passes through Canton, China, and

the Canary Islands. *Chihuahua*, a northern Mexican town, is situated in a rich grazing country. It has a healthful climate and is located at an elevation of 4,690 feet. Fifty miles from this place is the town of *Santa Rosalia* (4,022 feet), one of the most popular health resorts of Mexico, famous for its thermal springs.

#### SOUTH AMERICA.

This is a neglected field, which is unfortunate, as many pleasant and healthful places for winter residence are found along the coast and in the interior of the country. In the Andes are towns located at great elevations, where cases for whom high altitudes are desirable may find accommodations; of these we would mention the populous city of *Quito*, Ecuador (9,540 feet), which has a climate of perpetual spring; *Bogota* (8,650 feet), the capital of the United States of Columbia; *Cuzco* (11,380 feet), the ancient capital of Peru, and the towns upon the shores of Lake Titicaca, which lies between Peru and Bolivia, at an altitude of 13,000 feet.

Steamers run down the Pacific coast from San Francisco quite frequently so that the various ports in Western South America can be reached in comfort by a comparatively smooth voyage. From these points the various interior health resorts and especially those in the mountain regions have to be reached by a little travel. Vessels from ports on the Atlantic sea-board can be taken to places on the eastern coast.

The old method of reaching the west coast of South America around Cape Horn is out of date and only a very few now go by that route.

## TRANSLATION

Of that portion of Dr. Woeikof's "Die Klimate der Erde" relating to North and South America and the Atlantic Ocean.

From the German by S. KAUFFMANN, Philadelphia, Pa.

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### CHAPTER XII.

#### I. THE HIGH NORTH.

In high latitudes the parallels occupy so limited an area that it is preferable to consider all the countries of that region together. On the whole, therefore, the discussion in this chapter will comprise all the islands in the north of the three continents, Europe, Asia, and Africa, and the stations on the continents will be adduced by way of comparison only. The whole Arctic Zone is characterized by the absence of any very large and unbroken land and water areas, seas of moderate extent, covered with islands, being the prevailing feature. Only under and west of the meridians of West Europe do we find a more spacious and, at the same time, more elevated territory (Greenland), and, between it and Spitzbergen, a sea both broad and deep. The Asiatic continent, moreover, forms an exception by jutting out rather far into the Arctic Zone.

The causes of the low pressure of the atmosphere in the Arctic Zone have already been discussed in chapter 17; it is not only possible, but probable, that the existence of a great continent round about the pole, would have materially altered the conditions of the atmospheric pressure, more especially would a higher atmospheric pressure have been

found to prevail during the winter months. As it is, however, the sea predominating, and the mainland not being united into large masses, the pressure of the atmosphere during the winter in the Arctic Zone north of the continents, is nowhere perceptibly higher than 762 mm.

It rises towards spring, and generally reaches its maximum in May. This may be designated as an oceanic annual period, for it obtains likewise in the northern part of the Atlantic Ocean, and in that part of Europe and the neighboring islands which are most exposed to oceanic influences, (North and West Norway, Scotland, Faröe, Iceland). This high atmospheric pressure during the vernal months in the Arctic Zone, is probably due to the fact that the lowest temperature rules at that time in those regions, whilst it is rapidly rising in intermediate latitudes, especially on the continents. Accordingly the strata of equal atmospheric pressure ascend on the latter, bringing about a deflux towards the north pole regions, where, at this time, the ice-crust exists at its maximum, owing to the as yet unabated sway of the temperatures below zero, and to the diminished force of the winds, as compared with those of the winter months.

Regarding the annual course of the atmospheric pressure at the several stations in the Arctic Zone, it is most interesting to note the transition from the arctic maritime type proper, with its minimum of atmospheric pressure in winter and the maximum thereof in May, (Iceland, Spitzbergen, Francis-Joseph's Land), to the Asiatic continental type, with a maximum in January and a minimum in summer, May having withal a lower atmospheric pressure than the annual mean.

This transition seems to be effected on the north coast of Siberia, for at Sagastyr the atmospheric pressure



reaches its maximum in March, whereas, in December and January, it is but little higher than the annual mean. At Ustjansk however, more southerly and at a greater distance from the coast, the East Siberian type of the atmospheric pressure is already developed, with maximum in January and minimum in summer, the pressure in May being by nearly 5 mm lower than the annual mean.

From May till June the atmospheric pressure throughout the Arctic Zone undergoes an important change, whereby it is considerably reduced during the last month. The difference is greatest at the most northerly stations where man has, up to the present, passed the winter, to-wit: North Greenland and Grinnell Land. It is impossible not to think in this connection of the thermal conditions, which are everywhere in the Arctic Zone where observations have thus far been made, so constituted that, beginning with the 2d half of June, the temperature rises above zero and the ice begins to melt rapidly, so that, in June, a compact air maximum can no longer be found in the Arctic region. The other months of the year are in the whole Arctic Zone marked\* by no such significant peculiarities as those just considered.

The low atmospheric pressure prevailing during the greater portion of the year in the North Atlantic Ocean, particularly near Iceland, is well known to have also two sectional minima; the one in the West—in Davis Strait—is rather narrowly circumscribed, because the portion of the sea here generally open even in winter, is relatively small; but towards the northeast and east this Atlantic belt of low atmospheric pressure stretches much farther, and here both its extent and the height of the atmospheric pressure seem to be very variable. At all events, the pressure of the atmosphere, especially in autumn and winter, continues very low on a large part of the ocean which we may safely assume to

reach beyond Spitzbergen in the north, Francis-Joseph Land in the northeast, and Nova Zembla in the east. Nor does there exist here in winter a constant ice-crust, for the seas are expanded and exposed to strong winds, in consequence of which both the position and quantity of the ice are exceedingly changeable. This may be gathered, for instance, from the drift of the Payer-Wyprecht expedition, which, fastened to the ice, floated about with it for nearly two years between Nova Zembla and Francis-Joseph Land.

In all probability, the atmospheric pressure, like the temperature, of broad tracts, very largely depends upon the quantity of solid ice extant on this Europeo-Asiatic northern sea. Over a vast, continuous expanse of ice, the air can cool, as over a continent. This again will react upon the atmospheric pressure, which, under such conditions, will not be so low in the centre of the cyclones passing here, as in the case of their finding here much open sea. Anti-cyclones, on the other hand, find under such circumstances more favorable conditions.

The more westerly part of this ocean, more especially the region west and north of Norway up to  $75^{\circ}$  N. Lat., is at all times free from ice, and its mean atmospheric pressure in December and January, very low, viz: about 750 mm. Farther north the observations are too short to admit of conclusions as valid as those concerning the region near Norway. It is certain, however, that the pressure of the atmosphere has been found to be higher in the north, and even in the east, than here.

On the islands north of Europe, observations have been made, but, of course, no consecutive ones. They succeeded best on the western coast of Nova Zembla, where they have been conducted during five winters at an interval of  $1\frac{1}{2}^{\circ}$  latitude; three of these were pursued in the

Gulf of Malya Karmakuli and its vicinity; the results of the remaining two (1882-1883) have, as yet, not become known. Observations have furthermore been made at the southeast and north shore of Nova Zembla, between the latter and Francis-Joseph Land (nearly two years), and on Spitzbergen, Jan Mayen, and Bear Island. The temperature being very variable, and the observations having been very short, I here quote the means for the five months from November till March.

| N. Lat. | Mean Longitude.                                       | Mean Temperature. |
|---------|---|-------------------|
| 71°     | 8° W. N. Jan. Mayen (1882-83).                        | —6. 7             |
| 71°     | 26° E. Gjasvar, Norway.                               | —3. 6             |
| 75°     | 19° E. Bear Island.                                   | —10. 5            |
| 80°     | 16° E. Spitzbergen, Mossel Bay.                       | —15. 5            |
| 71°     | 57° E. Kamenka Bay, (S. E. Coast).                    | —17. 5            |
| 72°     | 53° E. Malya Karmakuli, (2) (W. Coast).               | —15. 3            |
| 73½°    | 55° E. Matotshkin Schar, (2) Shallow Bay. (do.)       | —15.              |
| 76°     | 54° E. Tobiesen Bay, (N. Coast).                      | —23. 2            |
| 79°     | 64° E. Bet. Nova Zembla and Francis-Joseph Land, (2). | —27. 6            |
| 71°     | 64° E. Kara Sea.                                      | —20. 8            |
| 72½°    | 76½ E. Gydaviken, (W. Siberia).                       | —25.              |

This table presents a fairly distinct index of the successive stages of the temperature, and of its decrease in winter in an easterly direction. With the variability of the temperatures, even the means out of five months may vacillate from one winter to another. It suffices to state an example for the less changeable climate of St. Petersburg, where the mean temperature for the months from November till March was equal to  $-2.1^{\circ}$  in 1881-82, and to  $-11.3^{\circ}$  in 1808-09; that is, during the latter period it was by  $9.2^{\circ}$  lower than during the former.

I have also included in the above table the most northerly station of Norway, which, as easily discernible, has the highest temperature. A little lower already are the temperatures on Bear Island and Jan Mayen, two small

islands in the European part of the Arctic Ocean. That even Jan Mayen has a colder temperature than Norway, is accounted for by the existence of more or less ice on the ocean contiguous to the former, whereas, near Norway, ice neither forms on the main sea nor does it find its way thither in the shape of drift ice. As on Iceland, so also on these two islands, the winds are predominatingly east and partly north, that is, such as may be expected to carry with them cold air. However, the temperature is determined by the quantity of ice on the ocean rather than by the wind.

Jan Mayen is the station on the earth's surface where the largest cloudiness is found in the annual mean. At Gjasvar, while considerable, it is not equal to that on Jan Mayen. About the character of the clouds the following is to be observed. In the latter part of autumn and in winter it is not different from that in the northern parts of Central and Western Europe, and the northern and central parts of Russia. In summer, however, the fogs and lower stratus-layers prevail which are found on the seas and coast stations of the High North in general. The great cloudiness found here is probably traceable, in the main, to the condensation of vapors, which is brought about when nearly saturated air-strata of different temperatures meet and permeate each other. This contrast in the temperature is here conditioned by the presence of ice and clear sea-water. Under the influence of warm currents, the last offshoots of the Gulf Stream, in shallow places near the coast, but still more under the action of the solar rays, the water is warmed to a temperature considerably above  $0^{\circ}$ . (In the vicinity of Nova Zembla  $10^{\circ}$  have already been measured on the surface.)

As far as broad areas of clear sea extend even in winter, and this is generally the case as far as the west coast of

Spitzbergen, there are, of course, sources of abundant precipitations, especially at some elevation above the sea-level. Glaciers are formed, partly reaching to the sea-level, notably on the more elevated and extensive islands of Spitzbergen.

Under the influence of warm winds, the temperature on Jan Mayen and Bear Island not infrequently rises in winter above  $0^{\circ}$ .

In the middle part of its west shore, the large double island of Nova Zembla has, considering the latitude, a rather high winter temperature, with variable winds, though south-east winds numerically predominate. The cloudiness is here considerable, though not to the extent of that on Jan Mayen, and, at times, winter months occur here with a cloudiness sufficiently small to approximate the conditions of Northern Siberia. Towards the north, in the direction of Francis-Joseph Land, and towards the east and south-east, the temperature of the winter months is considerably lower.

Notwithstanding the prevalence of lower winter temperatures in the southern part of the islands, no glaciers are to be found there. They are first met with in the middle part of the west coast, where the mountains are higher and the aggregate snow-fall heavier. Francis-Joseph Land is full of glaciers, and but few parts thereof are free from snow and ice, even at the end of summer. Accordingly, the Austrian expedition found the snow-fall to be considerable in the vicinity of the islands.

The mean temperature of the winter months on the European part of the Arctic Ocean has the remarkable peculiarity that January is much warmer than December, February and March, and nearly as warm as November and April. In the following table, A exhibits the mean temper-



ature on the west shore of Nova Zembla ; B the means at all the points of the preceding table, with the exception of Bear Island, Kamenka Bay, and the west shore of Nova Zembla, in both cases, however, without the observations made in 1882-83, and C, the means from A and B.

|    | Nov.   | Dec.   | Jan'y. | Feb'y. | March. | April. |
|----|--------|--------|--------|--------|--------|--------|
| A. | —12. 8 | —17.   | —13. 3 | —18. 9 | —15. 9 | —14. 2 |
| B. | —20. 2 | —24. 8 | —19. 2 | —27. 9 | —24. 5 | —18. 3 |
| C. | —16. 5 | —20. 9 | —16. 2 | —23. 4 | —20. 3 | —16. 3 |

The result is thus shown to be the same, whether the west shore of Nova Zembla between  $71\frac{1}{2}^{\circ}$  and  $74^{\circ}$  north latitude is considered by itself, or in conjunction with the observations made N. W. and N. E. thereof ; in either case, January appears remarkably warm in comparison to the preceding and following months. The colder temperature of February, and even of March, might eventually be ascribed to the conditions of the maritime climate of high latitudes ; but, were this the only cause, December would necessarily be warmer than January, whereas, on the contrary, it is by about  $3^{\circ}$ , and even  $5^{\circ}$ , colder.

The question arises, to what extent this phenomenon may be regarded as a general characteristic of the climate of the islands in the Arctic Ocean within the given limits. It is true, the means of but eight winters are given. But in all these winters January proved to be colder than February and December, and in but two of them was the temperature of March somewhat warmer, viz. by  $2^{\circ}$  and  $1.2^{\circ}$  respectively. I selected from observations embracing 140 years, and conducted at St. Petersburg, eight winters in which the temperature of January exceeded both that of December and that of February, and it was demonstrated that in

the mean for these winters December is by  $3.7^{\circ}$ , February by  $6.8^{\circ}$  colder than January, consequently by less than they are in the mean for all the winters above quoted.

We cannot but draw the inference therefrom that it is in the highest degree improbable that such rare conditions were found at Nova Zembla, Spitzbergen, etc., every time that the winter was passed there. There is much more reason for assuming that the relative warmth of January is a distinguishing feature of the climate of the Arctic Ocean within the given confines. This probably arises from the fact that the centres of cyclones pass northward at a short distance from these points more frequently in January than before or after. Besides, a cold February and, partly, a cold March is a rather ordinary occurrence in the maritime climate of high northern latitudes, there being in these months more ice and less open sea than in January; hence the considerable reduction of the temperature, which the sun is as yet very little able to counteract. A relatively cold December is peculiar to the northern belt of West Siberia. At Beresow, according to many years' observations, December is even colder than January, at Jeniseisk, Turnchansk, and Bogoslawsk, but little warmer. Possibly, and even probably, this phenomenon stands in a causal nexus with the paucity of cyclones on the Arctic Ocean in December, and their frequency in January. In West Siberia the severest cold usually occurs in calm and clear weather; that is, under conditions favorable for a strong local refrigeration. The motion of the air is altogether not conducive to cold weather (v. Chap. 26. the temperature of the winds at Jeniseisk). During the passage of the cyclones past Nova Zembla, southern, *i. e.*, warm winds, necessarily prevail in the northern belt of West Siberia. The fact that December is particularly cold as compared with January, especially

at Beresow, strongly speaks in favor of my hypothesis, in view of the greater proximity of this point to the Arctic Ocean.

Nor must it be wondered at that at Beresow, for instance, and still more at Jeniseisk, Bogoslowsk, etc., February is again warmer than January. This does not prove that during that month more cyclones have passed by Nova Zembla than in January, but it is due to the fact that in these latitudes, located as they are considerably south of the Arctic Circle, and with a continental climate, there must take place in the middle of the day, even with frequent calms, a pretty strong calefaction, which counteracts the nightly refrigeration.

On the islands of the Arctic Ocean under the meridians of Europe, (Bear Island, Spitzbergen, west coast of Nova Zembla) the winter is not so much remarkable for its cold as such, as for the continuity with which the temperature remains below zero during periods ranging from about eight months on Bear Island, and seven on Jan Mayen, up to nine months on Spitzbergen and Nova Zembla. It is obvious that neither agriculture nor tree-growth are possible under such conditions. On the slopes, however, notably those with southern exposures, quite a number of flowering plants are found. This is assignable to the fact that, in the far-north, both the condition of the soil and its inclination are of paramount importance. In level places the snow naturally melts more slowly, and the cold water, standing for a longer time, checks the development of vegetation. On dry slopes, especially when also somewhat stony, the water flows off more rapidly, and the surface of the soil is more easily warmed by the sun, all of which is, of course, favorable to vegetation.

The temperature of summer chiefly depends on the quan-

tity of ice in the environs of the place of observation. In the southeast of Nova Zembla, in Kamenka Bay,  $2.4^{\circ}$  is regarded as the mean temperature of July, but in the Shallow Bay,  $3\frac{1}{2}^{\circ}$  more north, it is  $5.3^{\circ}$ . Even on Spitzbergen, July proves to be warmer. The region of Nova Zembla, and, in some years at least, even the Kara Sea, apparently have the coldest summer obtaining anywhere in the Northern Hemisphere. The Danish expedition observed during its drift in the Kara Sea a mean temperature below  $0^{\circ}$  in June and August; for the latter month this had hitherto nowhere been observed. At Gydawiken also, a June temperature of less than  $-1^{\circ}$  was observed.

It is well known that the seas around Nova Zembla and along the coast of Siberia, were, not long ago, regarded as almost, or completely, inaccessible to navigation. In specially bad repute stood the Kara Sea and the waters north of Nova Zembla. Regardless of the bold voyages of our Cossacks and Promushlenni, regardless, also, of the fact that Barent passed the winter in the northern part of the Kara Sea, etc. many scientists were inclined to assume these seas to be covered with perennial ice, until the passages of the Norwegian seafarers clearly demonstrated the accessibility of the Kara Sea to such navigators as are equipped, even to a moderate extent, with the requisite special knowledge.

The conditions of this sea are climatically very interesting. It is of rather small dimensions, protected from warm westerly winds, and, towards autumn, filled with brackish water, owing to the influx of large volumes of water from the Obi and Yenisei, and to the melting of the ice on the sea and the contiguous territories. In consequence of all this the formation of ice proceeds rapidly. At a comparatively early season of the year the sea is almost solidly

frozen over, and at the beginning of summer the ice attains a considerable thickness. As the egress of the ice is often impeded by northerly winds it usually remains solid till mid-summer. Many navigators, finding at this time of the year a large mass of ice, came to the conclusion that the Kara Sea is impervious to navigation. They did not consider that if conditions prevail in the Kara Sea conducive to the formation and stability of ice, others exist there also favoring its melting, which are not found elsewhere in high latitudes, to wit, the emptying into this relatively small and not deep sea of such mighty rivers as the Obi and Yenisei. These introduce therein large volumes of comparatively warm water, their mouths being near  $70^{\circ}$  north latitude; and this water is sufficiently potent in its effect to melt, towards the end of summer, all, or nearly all, of the ice in the Kara Sea, thus rendering the latter accessible to vessels at that time of the year. The period during which it is so, is, of course, very short, since the freezing of the sea begins very early. But if the accessibility of the sea, though but for the space of one month and a half, is important from a practical point of view, it is a fact of particularly great moment for science that even here the masses of ice are a transitory and not a permanent phenomenon.

The sea and the islands north of Siberia, and east of the meridians of the Yenisei, are, as yet, a "*terra incognita*" to climatology. We can only draw conclusions as to the climate of these regions from quite brief naval observations, and from such as were made on the north coast of Siberia. So much is certain, however, that neither strong currents nor strong winds predominate here to the same extent as on the sea near Greenland. This is proved for the eastern portion of the North Siberian sea by the extremely short distance covered by the "Jeannette" during



her drift in the ice. The direction of the latter was constantly varying, as was also that of the Payer-Wyprecht expedition north of Nova Zembla, and of the Danish expedition in the Kara Sea, so that the maps of these drifts present an exceedingly tortuous network.

In the course of the "Jeannette" expedition, some small islands were discovered east of the New Siberian Islands, which are distinguished from the latter and from the continent by being covered with ice to a remarkable degree. This certainly indicates a larger snow-fall and a cooler summer than occur on the continent.

Observations were conducted for nearly two years at Sagastyr, in the Lena Delta. As was to be expected, both the winter and annual temperatures established by them were lower than under the same latitude in the east, and, during the winter months, higher than in the valleys and basins of East Siberia to about  $60^{\circ}$  north latitude. The direction of the wind in winter is here principally south, thus pointing to a higher atmospheric pressure in the valley of the Jana, where, indeed, the lowest winter temperature hitherto known has been found. At Pitlenkaj, under  $67^{\circ}$  north latitude, in the vicinity of Behring Strait, the winter is considerably warmer, the winds are much stronger, and predominatingly N. W., thus again pointing to the district of the Jana as the region of higher atmospheric pressure. The greater force of the winds at Pitlenkaj finds its explanation in the comparative proximity of the low atmospheric pressure of Behring Strait.

The atmospheric pressure found at Sagastyr is, particularly in the winter months, lower than could have been anticipated after former observations at Ustjansk.

The cloudiness during the summer months is at Sagastyr, as at all other stations in the High North, very considerable,

so much so, indeed, that it but rarely permitted an observation of the altitude of the sun to be made at noon. That this was not a peculiarity of the respective years, is proved by the circumnavigation of the "Vega," which also found it almost impossible to make observations of the altitude of the sun anywhere on these seas.

As the winter months at Sagastyr, and particularly February, are characterized by a limited cloudiness, the annual course of this element already strongly resembles the one observed in the East Asiatic Monsoon regions. Quite analogous, however, the phenomena are not. The winds in winter, although preponderatingly south, *i. e.*, blowing from the continent, have by no means the constancy of a Monsoon, nor are other winds rare. In summer, the prevalence of east winds is somewhat greater than that of south winds in winter, yet not to the extent of a genuine Monsoon. The clouds of the summer months are, moreover, mostly lower stratus-layers and fogs, and not rain-clouds. The amount of precipitations in these parts is, as yet, unknown to me, but, according to kind communications from Mr. Juergen, rains were by no means abundant in summer. The annual period of cloudiness at Sagastyr could perhaps be designated as high-northerly coast-type.

Before proceeding to the American polar regions, it will be of interest to give a general view of the northern forest boundary. The observations in the coldest interior regions of East Siberia show that, for some forest trees at least, it is possible to form high and dense clumps, even where the mean temperature of the year falls below  $-17^{\circ}$ , and that of January below  $-50^{\circ}$ . During some months, of course, an adequate degree of warmth must obtain, as is indeed the case in the district of Werchojansk, where the tempera-

ture of the three summer months rises above  $11^{\circ}$ , and that of July above  $15^{\circ}$ . On the chart of the mouth of the Lena and its environment, which is based on the surveys of the Russian Lena expedition, it may be seen to what extent the forest-boundary hinges upon the propinquity of the sea. On the Jana it reaches nearly to  $71^{\circ}$  north latitude; beyond this it recedes considerably southward under the meridians of Borchaja Bay, which extends for some distance in a southerly direction; again crossing  $71^{\circ}$  north latitude, it advances on either bank of the Lena to almost  $72^{\circ}$ , and is found farther west under about  $71^{\circ}$ . As both banks of the river are high, up to the delta, they afford protection against the cold winds and fogs of the coast, whilst the water of this mighty river itself is warmer than the air. At a not very great distance south of Sagastyr, the vegetation was altogether much more rich and varied, owing mainly to a greater amount of sunshine.

The influence exerted by the nearness of the Polar sea upon the northern forest-boundary is equally perceptible farther to the west. As far as known, this boundary reaches on the Taemyr peninsula as far north as on the Lena. Only in the most northerly part of Norway, however, does it extend to the shores of the Arctic Ocean, the action of which is here very far from being as inimical to vegetation as in other regions, and this simply because of its being free from ice.

On "Point Barrow," the most northerly headland in the west of the North American Continent, observations have been made showing a higher annual and winter temperature than is found under the same latitude ( $71\frac{1}{2}^{\circ}$ ) on the northern coast of Asia. Farther east, we have in North America a distribution of stations for observations which is most peculiar. On the shores of the islands of the North

American Archipelago in the High North, numerous, though short, observations have been made in the course of the many expeditions for the discovery of the north-western passage, and during that for the lost Franklin (1818-1854). Subsequently, English, American, and German north pole expeditions have penetrated still farther north, viz.: to the most northerly sections of Greenland and Grinnell Land. Southward, however, on the North American Continent, almost to 50° north latitude, the number of stations is exceedingly limited. Here, therefore, the separation of the High North from the remaining part of America is necessitated by the nature of the material.

On the islands north of America we find a region of a very low winter and annual temperature, which is, however, climatically essentially different from the coldest regions of Siberia.

The difference is most marked in this, that the low temperature is found here in parts where no high atmospheric pressure prevails in winter. The pressure of the atmosphere diminishes towards the south-east in the direction of the depression in Davis Strait, and is higher at the most northerly stations of Greenland and Grinnell Land. In the annual period, it is highest in May, partly also in April, but even then not higher than 765 mm.; in summer it is again lower. The low atmospheric pressure in the south-east is probably the cause of the predominating north winds in the Polar Archipelago, and at the northern extremity of America.

In the following table, "a" represents the direction of the wind on the peninsula of Boothia Felix; "b" that in Pt. Kennedy, where, moreover, the force of the wind has been taken into consideration.

## WINTER.

|   | N. | N. E. | E. | S. E. | S. | S. W. | W. | N. W. |
|---|----|-------|----|-------|----|-------|----|-------|
| a | 22 | 8     | 12 | 7     | 5  | 4     | 9  | 33    |
| b | 2  | 15    | 0  | 0     | 0  | 2     | 13 | 68    |

## SUMMER.

|   | N. | N. E. | E. | S. E. | S. | S. W. | W. | N. W. |
|---|----|-------|----|-------|----|-------|----|-------|
| a | 7  | 13    | 8  | 10    | 9  | 11    | 12 | 20    |
| b | 3  | 21    | 6  | .4    | .5 | 4     | 12 | 53    |

Owing to the shortness of the periods of observation on the Archipelago, exclusive of Greenland and Grinnell Land, owing, further, to the variability of the temperature and the not always accurately known corrections of the alcohol thermometers, the mean temperatures are left somewhat indefinite. Still, the observations agree in the main; at all stations there was at least one month colder than  $-29^{\circ}$ , and at most of the stations north of  $70^{\circ}$  north latitude, one month colder than  $-35^{\circ}$ . The absolute minima are in most cases below  $-40^{\circ}$ , but not so low, by far, as in the interior of East Siberia. Nine months have a temperature below  $0^{\circ}$ ; the summer is cool, and the differences between the various stations during the latter season are inconsiderable. Only at one point does the mean temperature of July rise to  $5.8^{\circ}$ , the highest in this region. It was observed at one of the northerly stations, Winter-Haven, under  $75^{\circ}$  north latitude, whilst the most southerly station, Winter Island, under  $66^{\circ}$  north latitude, showed the lowest July temperature, ( $2.6^{\circ}$ .) It is therefore not the influence of the latitude, but the large quantity of ice on the ocean which accounts for the low summer temperature. The absolute maximum



at any one of the stations is but  $16^{\circ}$ , and the mean temperature of the year is mostly below  $-14^{\circ}$ .

Such a climate is, of course, exceedingly unfavorable to vegetation, and trees are entirely out of the question. Yet, neither perpetual snow nor glaciers are to be found there, for the snow, which falls in but limited quantities, thaws pretty rapidly in summer. On the bays and sounds between the islands, more or less ice usually exists; even this, however, is not permanent, but is broken up almost every year by winds and currents, and, after a time, finds its way into Davis Strait. The accumulations of ice-masses occasionally found, do not, by any means, consist of very old ice, but have been piled up through the pressure of vast quantities of ice on the windward side of the land. On Grinnell Land, a large island west of Smith Sound, the most northerly meteorological observations on the earth have been made (up to  $82\frac{1}{2}^{\circ}$  north latitude), partly by the two English expeditions under Nares, and partly by the American expedition under Greeley, the latter of which extended over three years. The mean temperature of the year is here the lowest on the earth, whilst winter is not so cold as at the valley stations in the interior of North-eastern Siberia; February has here the lowest mean temperature, *i. e.*,  $40.1^{\circ}$ , and as this represents the mean out of five years, it is highly probable that the mean out of any number of years would coincide therewith. Such a result is naturally to be expected under this high latitude, where during nearly the whole of February the sun remains under the horizon. The stations of the North American Archipelago south of Grinnell Land, also, frequently show the lowest temperature in February, but, owing to their shortness, the observations have, no doubt, been largely affected by non-periodical fluctuations. The absolute minimum on

Grinnell Land is  $-56^{\circ}$ , which is the lowest temperature observed on the earth outside of the coldest stations of Siberia.

Greenland, the largest island on the earth, deserves special consideration also at the hand of the climatologist. In all probability, the whole interior is covered with a layer of ice, one of those continental accumulations traces of which have been found by geologists both in Europe and America. Only a comparatively narrow tract along the coast, up to about 600 m. above the sea-level, is in summer free from snow and ice, and even this not entirely, since the large glaciers, the spurs of the ice-masses in the interior, extend to the sea.

As far back as the fifties, Rink has expressed the opinion that the excess of precipitation over evaporation is in Greenland conveyed into the sea by glaciers, instead of by rivers, as in other countries. In addition to this, however, much water is carried into the sea in a fluid state, by means of the glacier-streams, which flow even in winter. The coast of Western Greenland has a permanent population and meteorological stations, and various expeditions have recently visited the inland-ice (Jensen, Kornerupp, Payer.) As a general result, it has been ascertained that the angle of incidence of the ice is less than  $1^{\circ}$ , and that only a few peaks rise above the ice. The expedition of Nordenskjöld advanced from the west coast into the interior to a distance of about 350 km. At the farthest point reached, the altitude was about 7000' (2100 m), and the inclination of the ice between the altitudes of 1500 m. and 2100 m. was only  $\frac{1}{4}^{\circ}$ .

Greeland extends over more than  $20^{\circ}$  latitude, and the summer is cool, even in the extreme south. Thus, at Lichtenau, under  $60\frac{1}{2}^{\circ}$  N. latitude, July has a mean temperature of  $8^{\circ}$ ; nearly the same ( $7.7^{\circ}$ ) is found at Jacobshaven under  $69^{\circ}$  N. latitude, whilst at Godthaab, lying between the

two points mentioned, it is only  $5.5^{\circ}$ , and at the northern station of Polaris Bay, under  $81\frac{1}{2}^{\circ}$  N. latitude,  $4.7^{\circ}$ . Consequently, the whole decrease of the temperature from Lichtenau to Polaris Bay amounts to only  $15^{\circ}$  per degree of latitude.

In winter, however, the decrease of the temperature towards the north is very rapid on the west coast up to  $79^{\circ}$  north latitude, where the island is broadest. The months from December to March have here mean temperatures below  $-30^{\circ}$ , while at Lichtenau the temperature in January falls no lower than  $-5.5^{\circ}$  and Fredericshab, under  $62^{\circ}$  north latitude, no lower than  $-9.6^{\circ}$ . The decrease of the temperature in January between  $60\frac{1}{2}^{\circ}$  and  $77\frac{1}{2}^{\circ}$  north latitude, is equal to  $1.5^{\circ}$  per degree of latitude, and is, consequently, ten times as great as in July. In the annual mean, the decrease of the temperature between these limits equals  $1.02^{\circ}$  per degree of latitude, being a nearer approach to that of the winter than of the summer. Accordingly, eight to nine months of the year have in Greenland the character of winter months.

In winter, as during the greater part of the year, Davis Strait has a partial minimum of the North Atlantic cyclones, wherefore Southern Greenland often receives warm, moist winds from the main sea. Farther north, the atmospheric pressure is higher during the greater part of the year; north-east winds predominate, carrying with them cold air. On the east coast of Greenland, also, under  $75^{\circ}$  north latitude, the German expedition observed during the nine colder months a decided predominance of frequently very strong north winds. The influence of Icelandic cyclones, which are attracted by the air in the interior of Greenland, is here already clearly discernible.

A comparison between the winter temperatures of

Greenland, Grinnell Land and the North American Archipelago on the one hand, and that of North-east Siberia on the other, reveals, as the principal difference, the prevalence of calms in the latter, and of strong winds in the American region. While this is less favorable to an intense local cooling of lower air-layers, and to extreme low temperatures, it is well calculated to promote the refrigeration of vast layers of air, both with regard to area and, more especially, with regard to elevation. Not only more cold air, but also larger quantities of sea-water and ice are sent forth from the high latitudes north of America. In the east and, particularly, in the west of Greenland, much ice is moved directly south by the largely preponderating high north winds, and by the strong constant oceanic currents. This is demonstrated, also, by the drifts on ice-fields, such as made by the ice-imprisoned ships "Resolute" and "Fox," by the crew of the German expedition of 1870, etc. They all drifted rapidly south, whilst for the European and Siberian northern seas, I had to record slow drifts only in varying directions.

Greenland has also its "Föhns." (Meteorology of Arctic Regions, Vol. I, Hoffmeyer, "Föhn du Grönland.") On the west coast they come from southeast. During their continuance, temperatures of  $6^{\circ}$  and  $7^{\circ}$  occur under  $69^{\circ}$  N. latitude, which is by  $24^{\circ}$  to  $25^{\circ}$  higher than the monthly mean, the air being, meantime, very dry, and the snow melting very rapidly. According to Hoffmeyer, the west coast has "Föhns" only when the atmospheric pressure is very high near Iceland, and low in Davis Strait. Under such circumstances the east slope of the island has abundant precipitations, the decrease of the temperature becomes more gradual, and the descending air reaches the west warm and dry.

## 2. MIDDLE LATITUDES OF NORTH AMERICA.

Regarding the High North I have already had occasion to observe that the climate of no part thereof, barring the northern part of Norway, is so well known to us as that of the Polar Archipelago of North America, and this owing to the wintering in those regions of many scientific expeditions, and to the one sent out for the search of Franklin. But south thereof, down to  $55^{\circ}$ , our knowledge of the climate exhibits a large gap, which is but inadequately filled up by short observations. In the region east of the Rocky Mountains, the temperature resembles in some measure that of the same latitudes of Central Siberia in the region of the Yenisei. The following table presents a comparison of the two regions.

|                           | N. Lat. | Jan.  | July. |
|---------------------------|---------|-------|-------|
| Ft. Simpson, N. A.....    | 62      | -28.2 | 15.7  |
| Ft. Chippewyan, N. A..... | 59      | -22.8 | 17.2  |
| Turuchansk .....          | 66      | -28.2 | 15.7  |
| Jeniseisk .....           | 58      | -23.5 | 19.6  |

The foregoing table shows that this interior region of North America also has a warm summer. In consequence of this, the forest boundary extends here likewise far north, viz., to  $70^{\circ}$  north latitude on the Mackenzie river, which is nearly as far as on the Yenisei and Lena. It is probable that the continental regions of North America have neither such low winter temperatures nor such a high atmospheric pressure as the interior of East Siberia. Presumably, however, the highest atmospheric pressure obtains on the American continent in winter. The weather in winter is here in a high degree "anti-cyclonic," that is, calms and moderate variable winds predominate, with mostly clear weather, although it is probable that warm winds also occasionally occur in winter. The Rocky



Mountains are in these parts rather distant from the ocean, and west of them lies the extensive basin of the Yukon river, which stretches over the western part of Canada and the whole interior of Alaska. This river empties into the Behring Sea, which already partakes of the character of a polar sea.

According to Dall, it is true, this applies more to the coasts of Asia than to those of America. Near the shore there are no forests, owing to the cold summer, but very extensive ones are found in the interior. The climate is here decidedly continental. Fort Yukon, for instance, under  $66\frac{1}{2}^{\circ}$  north latitude, has in winter a mean temperature of  $-31^{\circ}$ , and in summer, one of  $13.7^{\circ}$ . Considerable quantities of snow and rain fall respectively in winter and in summer. At Ikogmut, on the lower Yukon, there is a temperature of  $-17.3$  in winter, and of  $9.7^{\circ}$  in summer.

Most important are the observations on the island of St. Paul in the Behring Sea, under  $57^{\circ}$  north latitude. The air is here very humid throughout the entire year; the atmospheric pressure is low, especially in winter, and the minima are at times north and at others, south of the islands. Storms are frequent in winter, but comparatively rare in summer, when dense fogs predominate instead. The mean temperatures are: winter,  $-2.6^{\circ}$ ; spring,  $-1.6^{\circ}$ ; summer,  $6.7^{\circ}$ ; autumn,  $4.2^{\circ}$ . The climate is, therefore, of a pronounced oceanic type, with a limited annual range and considerable retardation of the temperature extremes. How much the temperature is lower on the North Pacific than on the North Atlantic is evidenced by the fact that on the small island of Grimsey, situated north of Iceland under the Arctic Circle, the temperature is nearly the same as on St. Paul, to-wit; winter,  $-1.8^{\circ}$ ; summer,  $6.4^{\circ}$ .

Observations have also been made on Unalashka, one of

the Aleutian Islands, under  $54^{\circ}$  north latitude. The temperature is here about  $2^{\circ}$  higher than St. Paul, whilst its annual course is the same. Here also, therefore, we find a mild winter with low atmospheric pressure and frequent storms, and a decidedly cool summer with predominating dense fogs.

The remaining middle latitudes of the North American continent must geographically be divided into three regions; to-wit: 1. A narrow coast-belt in the west, between the Pacific Ocean and the high mountains; 2. A region of mountains and plateaus stretching in an easterly direction across the Rocky Mountains to about  $100^{\circ}$  west longitude; 3. The remaining part of the continent, comprising the territory of the Mississippi (exclusive of the upper sections of its right tributaries), the Atlantic coast-belt, and the region of the Great Lakes, up to Hudson's Bay.

Both of the American continents lack extensive mountain-ranges trending in the direction of the parallels; all higher mountains have approximately the direction of the meridians. Owing to this arrangement of the mountain chains, which does not separate the degrees of latitude, the air currents have free scope north and south. In the part of the North American continent situated east of the Rocky Mountains, this condition receives additional strength, firstly, from the exceptionally great variation in the temperature with the degrees of latitude, and secondly, from the frequency of cyclone centres, especially in the Lake-region.

The west slope of North America is in this respect differently conditioned, being protected from the cold winter winds by high mountains, in the north and east. This region has in California a breadth of no more than about 200 km. and farther north it is still narrower. Clima-

cally, it includes also several larger mountainous islands, like Vancouver, Sitka, Kadiak, and many smaller ones. West winds are here prevalent everywhere, with the exception of the coast of Alaska, where frequent, though not violent, east winds occur.

On the Pacific Ocean, in the vicinity of the American shores, we find a region of high atmospheric pressure (anti-cyclones) ; in summer it is somewhat more north and more distant from the coast than in winter, and the atmospheric pressure in its centre is higher (767 mm.) North thereof is found, also, a region of low atmospheric pressure, particularly in winter near the Aleutian Islands ; in summer however, the atmospheric pressure in the valleys of the Sacramento and the Columbia is considerably below that of the coast, whilst to the north the low atmospheric pressure continues unchanged. (In June, 757 mm., near Unalashka.) On the west coast, and on the islands of Alaska, the winds are west and south-west, whilst California has in winter a predominance of southwest winds, and in summer, under the influence of the barometric depression in the interior, equally predominating west and northwest winds. The latter exceed the others in force ; at San Diego, 55 per cent. of the entire motion of the air comes from northwest, taking into consideration the force of the winds.

In summer, a rather cold maritime current passes along the coasts of California. The predominant direction of the wind being from the ocean, the coast of California has a colder summer than any other part of these latitudes, not even excluding the Southern Hemisphere, generally noted for its cold summer. The summer temperature at the elevation of the pass across the Sierra Nevada (2140 m.), is nearly the same as on the sea-shore at San Francisco, whilst at the latter place it is by  $16.8^{\circ}$  colder than at

Fort Miller, situated in the broad valley of the San Joaquin at a distance of no more than 200 km. from San Francisco.

Such a difference between the summer temperatures within so narrow a compass, is nowhere repeated on the earth, and yet the broad longitudinal Sacramento-San Joaquin valley is separated from San Francisco by a not overly high mountain range. These rivers empty into the Bay of San Francisco, and the temperature in the valley, in the vicinity of the gap, is considerably lower than south and even north thereof, as is shown by the following table:

| <i>Mean Temperature in July.</i> |                             | <i>Location.</i>  |
|----------------------------------|-----------------------------|-------------------|
| Fort Miller,                     | 37° north latitude, 30.6°.  | South of the gap. |
| Sacramento,                      | 38½° north latitude, 22.7°. | Near the gap.     |
| Marysville,                      | 39° north latitude, 25.4°.  | North of the gap. |
| Union Ranch,                     | 39½° north latitude, 27.4°. | North of the gap. |

Owing to the cold summer winds above referred to, the difference between the summer and winter temperatures on the west coast is very slight. The highest temperature obtains here in September, when the sea-winds begin to abate. According to Scott's computations, the 23rd of September has at San Francisco the highest temperature and the 9th of January, the lowest, so that the period of the rising temperature extends over 8½, and that of its fall over 3½ months only. Farther north, where the sea-winds are not so strong, the July temperature is even somewhat higher than in California. Still farther north, the summer is again cooler. On the west coast, as well as on the islands of Alaska, a genuinely oceanic climate prevails, with a mild winter, but cool summer, rendering agriculture a matter of impossibility. The mean temperature is here materially higher than on the east coast of America, but yet lower than under the same latitude on the west

coast of Europe, as may be seen from the following table :

|                               | Year. | January. | July. |
|-------------------------------|-------|----------|-------|
| Sitka, Alaska.....            | 6.3   | -4       | 13.2  |
| Dunwegan, Island of Skye..... | 8.    | 4 1      | 13.1  |

The interior of California, being sufficiently protected from cold winds, has also a warm winter. The summer is much warmer than on the coast, and the climate strongly resembles that of South Italy, and this not merely in the temperature, but also in the distribution of precipitations. Excepting the mountains, the summer is here absolutely rainless, the rainy season lasting from November till March. Summer and early autumn are so dry that the grain, after being cut, often remains in the field from June till the end of October without being exposed to injury.

The similarity of the climate with that of Southern Europe has led to a similar cultivation of the soil ; here, as there, the principal products are wheat and barley, which are sufficiently fostered by the rains of winter and spring, whilst maize requires here artificial irrigation. The cultivation of European species of fruits is likewise extensively carried on here, in particular, that of the grape vine, and in Southern California, besides, that of oranges and citrons. Altogether, the winter minima in California are not low, for neither in the coast region nor in the large interior valley does the temperature ever fall below 0°.

A subtropical distribution of rain, *i. e.*, great rain deficiency in summer, and copious rains during the colder months, reaches in Western America much farther north than anywhere else on the earth. It prevails up to 48° N. latitude, and the rainfalls along the coast are so profuse as to place the west slope of America between 45° N. latitude and the peninsula of Alaska, amongst the most rainy regions of the



earth. The neighboring islands, also, abound in rain, the annual fall on Sitka being equal to 225 cm., and at Fort Tongas, even to 292 cm. Under  $53\frac{1}{2}^{\circ}$  N. latitude, a glacier extends to the sea, the most southerly on the Northern Hemisphere. The abundant precipitations, and the circumstance that they principally occur in the latter part of autumn and in winter, are highly conducive to the accumulation of snow in the elevated regions, and, consequently, to the formation of glaciers. Under  $48^{\circ}$  N. latitude, the rainfall on the coast amounts to over 300 cm., whilst east of the Cascade Mountains, in the plains of the middle course of the Columbia river, it is less than 50 cm. Southern California, on the other hand, has but little rain, even on the coast.

In considering the decrease of warmth with the latitudes on the Pacific coast, we readily find the same to be greatly retarded between  $36^{\circ}$  and  $49^{\circ}$  N. latitude ; that is, in the very latitudes where, in Europe and Eastern North America, it proceeds at a rapid rate ; in the Atlantic States, for instance, between  $36\frac{1}{2}^{\circ}$  and  $45\frac{1}{4}^{\circ}$  N. latitude, it is equal to  $1.26^{\circ}$  per degree of latitude.

This retarded decrease of warmth on the Pacific coast is unquestionably due to the cool spring and summer of Central California. Following is the decrease per degree of latitude :

|                                 | <i>January.</i> | <i>July.</i> | <i>Year.</i> |
|---------------------------------|-----------------|--------------|--------------|
| Southern California.            |                 |              |              |
| (S. Diego to Monterey).         | .49             | 1.72         | .94          |
| Middle and Northern California. |                 |              |              |
| (Monterey to Ft. Umpqua).       | .48             | .07          | .26          |
| Oregon and Washington.          |                 |              |              |
| (Ft. Umpqua to Camp Steele).    | .75             | -.26*        | .27          |
| British Columbia and Alaska.    |                 |              |              |
| (Camp Steele to Sitka).         | .47             | .46          | .52          |

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\* This is an increase in warmth with the latitude. Camp Steele itself, being protected, in a measure, from the open sea, is somewhat colder in winter, and warmer in summer than would otherwise be the case.

For the study of the variation of warmth with the altitude, California is a barren field. The coast stations are not available as a basis, because of their abnormal temperature. Altogether, I could utilize in this case Fort Miller and Camp Independence only, the difference in the altitudes of which is considerable, and which are sufficiently close to one another. The decrease of warmth is very slow, viz: per 100 meters, annually  $33^{\circ}$ , winter  $41^{\circ}$ , summer  $23^{\circ}$ . In the absence of any details respecting localities or other circumstances, I must, of course, refrain from further conclusions.

A considerable section of the United States, bounded by the Sierra Nevada in the west and the Rocky Mountains in the east, is made up almost completely of plateaus, here and there culminating in mountains. Owing to the aridity of the air, and the entirely inadequate quantities of precipitation, the water-courses, as a rule, do not reach the sea. The Colorado with some of its tributaries, which arise in more humid mountain regions, form an exception. The great aridity gives rise to a considerable daily range, amounting, for some points in these regions, to a mean of over  $18^{\circ}$ . This wide range obtains both in the valleys and on the plateaus.

Some of the southern districts of this region are situated below the sea-level; as, for instance, the "Desert of the Colorado" and the "Valley of Death," in California. Here, as in the lower valleys of the Colorado and Gila, the summer is scarcely less hot than in the Sahara and in Northern India. The mean temperature of July exceeds  $34^{\circ}$ , and the absolute maxima rise to  $50^{\circ}$ .

The lower valleys and the less elevated plateaus are exceedingly dry, and compare in this respect with the Aralo-Caspian Plain and East Turkestan in Asia. Cultivation of the soil is, of course, impossible here without artificial irrigation. On the higher plateaus it is somewhat less dry,

and there is more precipitation, particularly in summer on the mountains, wherefore luxurious grass plots, and even forests, are found there.

With reference to the periods of precipitation, the following is to be observed: The Sierra Nevada constitutes in this regard a climatic boundary line; on its western slope and on its crest, copious precipitations—in the shape of snow, of course—occur in winter; farther to the east, in the lower valleys and in the desert, it is dry during the whole year; north thereof, on the higher plateaus of Utah and Nevada, somewhat larger quantities of water are here and there precipitated, with maxima in December and May, whilst summer and autumn are very dry. In New Mexico and Arizona, however, most of the rain falls in summer, 40 per cent. of the annual rainfall occurring in July and August.

The plateaus and low deserts are so exceedingly arid, that the rivers traversing them not only lose much water by evaporation, but receive no afflux for long distances. They all obtain their waters from the mountains. These rivers are remarkable for the extraordinary depth of their channels, so-called cañons, which are in some instances 1800 m. deep, with mostly perpendicular sides. The latter circumstance is an additional proof of long continued aridity, without which atmospheric disintegration would have caused the sides of these chasms gradually to assume a somewhat sloping direction.

Owing to the elevation of these territories and to the absence of precise data concerning the altitudes, we are yet in some doubt as to the height of the atmospheric pressure. Loomis and Hazen have found the isobare on the plateau of Utah to be 768 in January, and 757.5 in July. Even without reduction to the sea-level, the atmospheric pressure is here materially higher in winter than in sum-

mer, although the difference is not so great as on the almost equally high plateau of East Turkestan in Central Asia. At Yarkand in East Turkestan, 1257 m. high, the difference amounts to 14.1 mm., more than double the difference found at Salt Lake City.

The disparity in the elevation, and the numerous mountains of these regions, naturally operate as strong local influences on the direction of the wind. The condition of the atmospheric pressure, however, is such as to cause, *south of 42° north latitude, a preponderance, in the main, of north winds in winter, and of south winds in summer; that is, in winter there is an air-current from the plateaus to the gulfs of California and Mexico, and in summer, vice versa.* (Coffin "Winds of the Globe" p. 682 to 685, Supan "Statistics" p. 188 to 193).

The whole western plateau region of the United States, together with the low deserts and valleys located therein, is very warm, with a reduction, for the plateaus, of course, to the level of the sea; the mean annual temperature of this region, to 35° N. latitude, exceeds 23°, which is higher than anywhere else on the earth in these latitudes. Even the regions on the Mediterranean Sea, so much favored in this regard, are colder, for the isotherme of 20° is found south of the Mediterranean under 33° N. latitude, and only in the Algerian Sahara does it advance to 35° N. latitude. Lissabon, on the west coast of the Pyrenean Peninsula, under 38° N. latitude, lies on the isotherme of 16.2°, whereas Salt Lake City in Utah, under 41° N. latitude, is located on the isotherme of 18.2°. Presumably, the explanation for this phenomenon is to be found in this, that the aridity favors a strong calefaction in summer, even at considerable elevations, whilst in winter, the cold winds are warded off by mountains.

The high plateaus extend also east of the Rocky Moun-

tains to about midway between the latter and the Mississippi river, and descend very gradually to the eastern lowlands. Having little or no protection against the cold winds, these eastern table-lands have, on the whole, a cooler climate than those in the west; yet, with reduction to the level of the sea, they are warmer, when compared to the lowlands lying east of them. In some instances, the temperature on the plateau is even higher than in the same latitudes on the plain, as exemplified by a comparison of Ft. Laramie with Dubuque, and of Muscatine, Iowa, with Winnebago, Illinois, etc. The case is here all the more significant as lowland and plateau are separated by neither mountain nor precipitous declivity, the protection of which against the colds of winter, like that afforded by the Rocky Mountains to the western plateaus, could be looked upon as an explanation. Under present circumstances we can but assume that plateaus of vast extent are already under about  $40^{\circ}$  latitude considerably warmer at the same altitude than the open air, or mountains, and that the laws governing the variation of temperature with the altitude, are much more easily determined in the case of isolated peaks than on plateaus, more especially, where, as in the case under consideration, a very gradual ascent augments the vertical difference by a horizontal one.

The heating of the plateaus at the eastern base of the Rocky Mountains being an anomaly, both with regard to latitude and to altitude, the regions contiguous thereto present, of necessity, a rapid decrease of the temperature with the altitude, as demonstrated by the valuable observation on Pike's Peak (4300 m. high). It is this high temperature, notably of the summer months, which produces in the Rocky Mountains a rather luxuriant vegetation at heights which in other mountains of the same and even



lower latitudes, are bare and desolate because of the cold. Thus, there are forests on Pike's Peak up to the height of 3600 m.

Even under the tropics, forests of high-grown trees are not found at so great an elevation. The summer is here actually as warm as at the same elevation on the equator. Reducing, for instance, the temperature of Pike's Peak to the altitude of the "Dairy of Antisana" ( $1\frac{1}{2}^{\circ}$  S. latitude, 4060 m. above the level of the sea), we obtain for July a temperature of  $6.4^{\circ}$ , whilst the warmest month at the latter point has a temperature of  $6.2^{\circ}$ . At the elevation of the forest-boundary on Pike's Peak, the conditions are probably still more favorable as compared with those of the tropics. Apart from the temperature, it is essential to the forest vegetation that the rainfalls in summer are adequate, and that the principal chain of the Rocky Mountains affords protection from the strongest (W.) winds.

Pike's Peak is the highest meteorological station on the earth, and its isolated location is exceedingly favorable to observations. To the east of it lies a plateau 1800 m. above the sea-level; to the south, another table-land, from 2200 to 3000 m. high, separates it from the principal chain of the Rocky Mountains. In the *American Journal of Science* (January, 1878), Loomis has stated the number of strong winds, *i. e.*, such as have a velocity of more than 30 English miles per hour, or 11.6 m. per second; 25 per cent. of the observations determined winds of such force, which is certainly very moderate for so considerable and so isolated a height. Observations at  $7\frac{1}{2}$  A. M. and at 11 P. M. established for either of these hours 27 per cent. of such winds, whilst those made at  $4\frac{1}{2}$  P. M. yielded but 21 per cent., *thus proving here also the prevalence of less*

*strong winds in the middle of the day.* Also a much more clearly defined annual period manifests itself, for January had 45 per cent. of such strong winds, and July but 2 per cent. The direction of the wind was as follows:

|   | N. | N.  | E. | S. E. | S. | S. W. | W. | N. W. |
|---|----|-----|----|-------|----|-------|----|-------|
| Per cent. of strong winds (more than 11.6 m. per second). | 7. | 1.2 | 0  | .3    | 5  | 31    | 42 | 13    |
| Direction of Wind. { Winter.                              | 14 | 8   | 1  | 2     | 5  | 19    | 28 | 23    |
| { Summer.   | 10 | 11  | 4  | 3     | 8  | 32    | 18 | 14    |
| { Year.   | 12 | 9   | 3  | 2     | 5  | 27    | 14 | 19    |

This table shows, in the main, the predominance of west winds, with a tendency in winter to north, and in summer to south. This predominance of west winds is even greater amongst the strong winds, 86 per cent. of which are S. W., W., and N. W., whilst but  $1\frac{1}{2}$  per cent. thereof are N. E., E., and S. E.

Loomis has also cited instances in which Pike's Peak was about  $25^{\circ}$  colder than Denver, *i. e.*, where the difference in the temperature of the two points corresponded to the unstable equilibrium of the vertical; and others, again, in which Pike's Peak was warmer than Denver.

In rate per cent. of the observations the following numbers of cases occur:

DENVER COLDER THAN PIKE'S PEAK.

|                         | Nov. to Feb.* | January. | Year. |
|-------------------------|---------------|----------|-------|
| 7 a. m. and 9 p. m..... | 6             | 13       | 1.8   |
| 2 p. m.....             | 3             | 9        | 1     |
| Mean .....              | 5             | 11       | 1.6   |

\* Not one instance from March till October.

## DENVER BY 25° WARMER THAN PIKE'S PEAK.

|                   | Dec. to<br>Feb. | March,<br>April. | May. | June,<br>July. | August,<br>Sept. | October,<br>Nov. | Year. |
|-------------------|-----------------|------------------|------|----------------|------------------|------------------|-------|
| 7 a m. and 9 p.m. | 0               | 1.6              | 3    | 0              | .8               | 1.1              | .8    |
| 2 p.m.....        | 1.7             | 23               | 53   | 29             | 16               | 12               | 18    |
| Mean.....         | .6              | 9                | 20   | 10             | 6                | 5                | 7     |

Thus one in every nine observations in January shows a higher temperature on the mountain, a further proof that the temperatures in winter are by no means extraordinarily low on high mountains. Cases in which the decrease of the temperature with the altitude is so great as to correspond with the unstable equilibrium, are rather frequent in spring and summer, and very rare in winter. They are most frequent in May, for the reason, probably, that considerable warmth has already been imparted to the plateau, while large quantities of snow still exist on the mountain.

In summer there are also found on the Peak "open places." These cases, however, the number of which is diminishing, are exceedingly rare in the morning and in the evening, being at all seasons almost exclusively confined to the warmer hours of the day.

The eastern part of the North American continent in middle latitudes, stands under the influence of the low atmospheric pressure of the North Atlantic Ocean, especially of that partial minimum thereof which is found in Davis Strait; in winter, in the latter part of autumn, and in the early part of spring, when these cyclones have reached a particularly strong development, the winds north of 42° N. Lat. are more N. W. than S. W. This fact has an important bearing on the temperature, because the cold and dry air from the interior of the continent is thereby carried far south and east.

Of the regions of high atmospheric pressure, those especially are of great influence in winter which are located, on the one hand, at the eastern base of the Rocky Mountains, and, on the other, in the Southern States. None of these anti-cyclones, however, is as constant as that found in the eastern part of the Atlantic Ocean at the northern limit of the trade-winds, and, above all, as the one obtaining during the colder months in the interior of East Siberia. None, therefore, is equal to the latter in the potency and uniformity of its influence on the climate, so that variability, both of atmospheric pressure and of temperature and cloudiness, forms a leading feature in the climate of the Eastern United States. More especially do great and rapid changes take place in conjunction with the cyclones so frequently traversing the northern part of the United States from the Upper Missouri to the St. Lawrence, moving thence in the direction of Nova Scotia.

Nowhere on the earth are cyclones of more frequent occurrence than right here. The velocity of these cyclones is, even in the mean, twice as great as in Europe, and the attendant changes of the weather are, consequently, singularly abrupt. The fluctuations in the temperature are greatly increased by the unparalleled variation of the temperature with the latitude, which is caused by the existence, to the south, of the Gulf of Mexico, the temperature over which is higher than over other seas of the same latitude, whilst under  $50^{\circ}$  north latitude the temperature is lower than in other countries of the same latitude, with the exception of East Siberia.

In summer the cyclones are less frequent, although the track along which they principally travel remains the same; but at that season of the year, the atmospheric pressure in the

interior is lower than at the Gulf of Mexico, in consequence of which south winds predominate in summer throughout the south of the United States. In Texas they are S. E., and further to the east and north, S. and S. W. Even on Pike's Peak this veering to the south is noticeable in summer.

In preparing the comprehensive material collected by Coffin, concerning the United States, I advanced the following opinion :

An extensive part of the United States, embracing about one-third of the whole exclusive of Alaska, shows, notwithstanding the diversity of the topographical conditions of the country, a nearly uniform annual period of winds. The latter are throughout this region in winter chiefly N. and N. W., and in summer S. E., S., and S. W., with a great resultant in the south, and a diminishing one towards the north. This region extends from the Sierra Nevada in the west to the Mississippi in the east, and from the Gulf of California, the valley of the Rio Grande, and the Gulf of Mexico, in the south to  $40^{\circ}$  north latitude in the north.

Following are some figures setting forth the direction of the wind east of the Rocky Mountains :

## WINTER.

|   | N. | NE. | E. | SE. | S. | SW. | W. | NW. |
|---|----|-----|----|-----|----|-----|----|-----|
| Territory of the Middle Missouri<br>(Kansas and Nebraska).....                              | 22 | 8   | 6  | 9   | 15 | 12  | 18 | 20  |
| Territory of the Mississippi (be-<br>tween $38^{\circ}$ and $43^{\circ}$ north latitude) .. | 9  | 8   | 5  | 15  | 12 | 13  | 14 | 24  |
| Territory of the Upper Mississippi...   | 7  | 9   | 5  | 16  | 11 | 15  | 10 | 26  |
| Indian Territory.....   | 20 | 11  | 14 | 15  | 12 | 9   | 6  | 13  |
| Central Texas .....   | 29 | 22  | 9  | 14  | 8  | 6   | 5  | 9   |
| Lower Rio Grande.....   | 16 | 11  | 13 | 20  | 15 | 5   | 4  | 15  |



## SUMMER.

|  | N. | NE. | E. | SE. | S. | SW. | W. | NW. |
|--|----|-----|----|-----|----|-----|----|-----|
| Territory of the Middle Missouri<br>(Kansas and Nebraska) .....          | 10 | 10  | 13 | 18  | 26 | 13  | 10 | 10  |
| Territory of the Mississippi (be-<br>tween 38° and 43° north latitude).. | 9  | 10  | 9  | 22  | 16 | 12  | 11 | 11  |
| Territory of the Upper Mississippi..                                     | 6  | 11  | 7  | 21  | 13 | 21  | 10 | 12  |
| Indian Territory.....  | 6  | 8   | 14 | 22  | 27 | 12  | 5  | 6   |
| Central Texas.....   | 3  | 6   | 11 | 54  | 17 | 6   | 2  | 1   |
| Lower Rio Grande.....  | 1  | 5   | 17 | 52  | 16 | 8   | 1  | 1   |

In Southeastern Texas (Rio Grande) the prevailing conditions approximate those of the trade-winds ; but here, too, the north winds are the strongest. In Central Texas we observe already an actual Monsoon, and this, furthermore, with a distribution of the relative humidity which is characteristic of veritable Monsoon regions, as at San Antonio, for instance, where it is as follows: winter 49 per cent., spring 63 per cent., summer 77 per cent., autumn 64 per cent. The distribution of precipitations in Central Texas very strongly resembles that of Eastern Japan, in that it has a decided minimum at the beginning and at the end of the moist Monsoon period, occurring, respectively, in June and September.

According to Loomis, the Lower Missouri has in winter a higher atmospheric pressure than the surrounding territories, (up to 768 mm.). A second maximum is found in the Southern States west of the Appalachian Mountains (somewhat over 767 mm.). From here northward, *i. e.*, towards the Great Lakes, the atmospheric pressure becomes lower, resulting in W. S. W. as the mean direction of the wind in winter and summer. In the south, on the shores of the Mexican Gulf, an approximation to the trade-winds is already observable, with predominating east winds,

which, however, owing to the lower atmospheric pressure in the interior of the continent, take in summer a more south-easterly, and in winter a more northerly direction. Most constant are these east winds in autumn, when a more pronounced maximum has been developed here, and when the atmospheric pressure on the Caribbean Sea has reached its annual minimum. Florida presents a still closer approximation to the conditions of the trade-winds.

On the Atlantic coast, the influence of the minimum prevailing near Nova Scotia and New Foundland, is already very obvious, particularly in winter. In the Southern States there are even in winter more south-west than north-west winds, whilst in New England already the north-west winds are decidedly predominant in winter. In a still higher degree is this the case in Labrador, where even in summer north winds, or rather north-east winds, predominate, whereas in Southern New England south-west winds are the rule at that season of the year, which, however, is determined to some extent by the trend of the coast. Even greater than in New England in general, is the preponderance of north-west winds in winter on Mt. Washington, the highest peak of New England, where the direction of the wind is in summer still more northerly than in winter. Very remarkable, besides, is the great force of these winds, amounting in the mean to 13, 18, and 22 m. per second for S. W., W., and N. W., respectively.

In the winter months, temperatures of  $-40^{\circ}$ , with wind-velocities of 40 m. per second and upwards, are there no rare occurrence. These conditions are quite dissimilar to those of the mountains of Europe, where no such low temperatures occur on isolated peaks.

## WINTER.

|  | N. | N.E. | E. | S. E. | S. | S.W. | W. | NW. |
|--|----|------|----|-------|----|------|----|-----|
| Territories of the Ohio and Tenn..                 | 8  | 7    | 5  | 9     | 12 | 28   | 16 | 16  |
| N. Shore of Gulf of Mexico.....                    | 19 | 16   | 9  | 14    | 9  | 9    | 6  | 18  |
| Bahamas and Florida S. of 29° N.<br>latitude ..... | 14 | 28   | 14 | 18    | 7  | 5    | 3  | 11  |
| South Atlantic States .....                        | 13 | 13   | 7  | 6     | 11 | 18   | 14 | 17  |
| Middle Atlantic States.....                        | 9  | 12   | 5  | 6     | 7  | 14   | 19 | 28  |
| New England.....                                   | 9  | 11   | 4  | 7     | 7  | 14   | 15 | 33  |
| Labrador.....                                      | 16 | 5    | 8  | 1     | 2  | 1    | 5  | 64  |

## SUMMER.

|  | N. | N.E. | E. | S. E. | S. | S.W. | W. | NW. |
|--|----|------|----|-------|----|------|----|-----|
| Territories of the Ohio and Tenn....               | 7  | 11   | 7  | 9     | 11 | 31   | 12 | 11  |
| N. Shore of Gulf of Mexico.....                    | 10 | 12   | 9  | 18    | 13 | 15   | 10 | 13  |
| Bahamas and Florida S. of 29° N.<br>latitude ..... | 2  | 15   | 28 | 32    | 11 | 5    | 4  | 2   |
| South Atlantic States.....                         | 7  | 12   | 8  | 12    | 17 | 26   | 11 | 8   |
| Middle Atlantic States.....                        | 8  | 10   | 6  | 11    | 14 | 19   | 16 | 15  |
| New England ...                                    | 5  | 10   | 8  | 10    | 12 | 24   | 14 | 16  |
| Labrador.....                                      | 20 | 36   | 8  | 2     | 1  | 1    | 2  | 30  |

The prevalence of cold ocean currents in the proximity of the east coasts of North America up to 44° N. Lat., and the fact that Hudson's Bay, on which the ice remains solid to midsummer, extends to 53° N. Lat., give rise to a colder summer in the eastern part of the continent than is found in the central part thereof. The region of cold summers comprises here, moreover, a much larger area than in East Asia, where it is confined to a narrow border along the coast. The extensive lakes and marshes in the eastern part of the continent contribute their share, also, to this low summer temperature.

The five Great Lakes of North America, the greatest aggregation of fresh water on our earth, must needs exert a far-reaching influence on the climate of circumjacent sections.

This influence naturally manifests itself, upon the whole, in a manner analogous to that of salt water, viz., winter and autumn are, under otherwise like circumstances, rendered warmer, spring and summer, cooler. But, where several months have a mean temperature below zero, a marked difference obtains between fresh and salt water.

Winchell very justly directs attention to the influence of the winds. As they are chiefly west in autumn and winter, the temperature of the east shores is moderated by them in a much higher degree than that of the west shores. In spring and summer this is by no means equalized, because of the prevalence of east winds in these seasons. The difference is brought out most clearly by a comparison between Grand Rapids on the east shore, and Milwaukee on the west shore of Lake Michigan.

The influence of the Lakes is most potent on the peninsula between Lake Huron and Lake Michigan, so that at Ft. Mackinac the difference from January till July is but  $25.3^{\circ}$ , at Thunder Bay, even no more than  $22.5^{\circ}$  C. Such a slight difference is found nowhere else between the Rocky Mountains and the Atlantic Ocean north of  $37^{\circ}$  north latitude.

The climate is coldest on the western extremity of Lake Superior (Superior, Beaver Bay). In winter the cold northwest winds have free access thereto, and in December and January the lake is frozen over for a considerable distance. The east winds which frequently occur in spring cause the ice to retain its place for a long time. After very cold winters, like that of 1873 for instance, a portion thereof does not thaw before June. Superior has accordingly a temperature of but  $3.2^{\circ}$ , in the annual mean which, reduced to the level of the sea, equals  $4.3^{\circ}$ , and is therefore but  $0.6^{\circ}$  higher than that of St. Petersburg ( $3.7^{\circ}$ ).

The temperature of July, also, even when reduced to the sea-level, exceeds that of St. Petersburg by only .9°. A comparatively high temperature, per contra, is found on the south shore of Lake Erie.

That the Great Lakes are more decidedly operative in retarding the temperature than the Atlantic Ocean, is accounted for by the fact that the water of the ocean, being kept as it is in a state of perpetual agitation, cools much less during the winter than that of the Lakes, where, moreover, as long as the temperature continues below zero, the formation of ice proceeds, which more and more reduces the area of the water's surface in a liquid state, tending to the mitigation of the extremes of cold.

In spring, when the temperature rises above zero, much warmth is absorbed by the melting of the ice; this renders the spring months much colder than they would be without these expansive water-areas and the formation of ice.

In autumn the temperature is raised by the agency of the Lakes, causing the first frosts especially to set in later on their shores.

Where the influence of the Lakes is particularly strong the summer down to 46° north latitude, is as cool as in European Russia, a condition which probably obtains also in the western part of North America in the vicinity of the Rocky Mountains under 50° north latitude.

The absolute extremes are likewise moderated by the Lakes. At Detroit, Cleveland, Rochester, Buffalo, for instance, they are higher than in the region of the Ohio south thereof. At Sackett's Harbor, at the north-east extremity of Lake Ontario, and at Governor, in its immediate proximity, the extremes are again much lower, because of the directness with which the cold air can reach there from the north, *i. e.*, from Canada.



The absolute minima in the region between the Rocky Mountains and the Mississippi north of  $40^{\circ}$  N. Lat., are very low. The lowest hitherto known in the United States, exclusive of Alaska, is  $-50.6^{\circ}$ , which is found at Pembina, on the Red river of the North, in  $49^{\circ}$  N. Lat. The next lowest are the temperatures in the east of the plateau region, as at Ft. Sanders and Washakie (Wyoming), and at Ft. Ellis (Montana), where they equal  $-45.6^{\circ}$ ,  $-47.5^{\circ}$ , and  $-47.2^{\circ}$ , respectively, and everywhere in this region where data from at least five years' observations are extant, we find minima of no less than  $-30^{\circ}$ . As, on the other hand, very high temperatures are observed in summer, the difference between the absolute extremes is here very great, partly above  $80^{\circ}$ .

The low absolute extremes during the winter are characteristic of the plateaus east of the Rocky Mountains, and constitute an essential difference from what is observed west thereof. Compare, for instance, the points in Montana with those in Idaho, or Ft. Laramie with Salt Lake City. The mean temperatures of the winter months differ much less.

The region on the Middle Mississippi is noted for the rapid changes in the temperature frequently occurring there in winter. They are all the more palpable as they involve, at times, a change from  $15$  to  $20^{\circ}$  above zero to as many degrees below zero.

South of  $40^{\circ}$  north latitude the thermometer rises sometimes in February already above  $25^{\circ}$ , as at St. Louis, Jefferson Barracks, and various stations in Kansas. At Ft. Leavenworth  $-32.2^{\circ}$  and  $25.6^{\circ}$  have already been observed in February; in Arkansas and the Indian Territory, even January occasionally shows a temperature of more than  $25^{\circ}$ .

If North America east of the Rocky Mountains is alto-

gether distinguished by non-periodical variations as no other country under the same latitude, this is pre-eminently the case in the territory of the Middle Mississippi. Further north, especially in Dakota, the maxima in winter are not so high; at Fort Abercrombie, for instance, they rise in January to  $6.1^{\circ}$ , in February to  $6.7^{\circ}$ . In Montana the maxima are again higher, being at Fort Shaw  $23.3^{\circ}$  in December,  $19.4^{\circ}$  in January,  $21.7^{\circ}$  in February. These high winter maxima are probably produced here by the "Föhns," called "Chinook-winds" in this region.

The variations of the temperature in Texas, while not greater, have, nevertheless, been more distinctly recognized. A suddenly arising north wind (Norther, Norte) now and then depresses the temperature from  $25^{\circ}$  to the freezing point. Much exaggeration, however, has been permitted to slip into the statements touching this point, as I have learned from the journal of a most careful observer, Dr. Pettersen of San Antonio, and through oral inquiries.

But, although sudden and great depressions of the temperature are not quite so frequent as commonly asserted, they form nevertheless one of the most conspicuous peculiarities of the climate of that region, and there is no country under the same latitudes where non-periodical variations are so great as in Texas, especially when shorter periods, and not whole months, are considered. As far south as Ft. Brown, located at a distance of scarcely two degrees from the tropic, the temperature falls to  $-6.7^{\circ}$ . These low temperatures are, however, all the more remarkable as the means of the winter months are not low, amounting, for instance, at Ft. Brown in January, to  $15.3^{\circ}$ . In China equally low minima are possible under the same latitudes, but there the mean temperature of the winter is much lower than in Texas.

## ABSOLUTE EXTREMES IN TEXAS.

|                    | December. |       | January. |       | February. |       |
|--------------------|-----------|-------|----------|-------|-----------|-------|
|                    | Max.      | Min.  | Max.     | Min.  | Max.      | Min.  |
| Ft. McKavett.....  | 27.2      | —13.9 | 26.7     | —14.4 | 31.7      | —12.8 |
| Ft. Inge.....      | 28.9      | —7.2  | 31.1     | —11.2 | 32.2      | —6.7  |
| Ft. McIntosh.....  | 33.9      | —8.3  | 32.2     | —7.2  | 38.3      | —5.0  |
| Ringgold Barr..... | 32.2      | —7.8  | 32.2     | —6.7  | 37.8      | —3.3  |
| Ft. Brown.....     | 31.7      | —5.6  | 30.6     | —6.7  | 32.2      | —2.2  |
| Austin .....       | 30.0      | —12.2 | 30.6     | —14.4 | 30.6      | —7.2  |

Thus, some winter months show a difference in the absolute extremes of more than  $40^{\circ}$ , and this south of  $30^{\circ}$  N. Lat. On the southern shores of the Mediterranean Sea, the absolute variation of the whole year is not so great as it is here in winter.

We observe in Texas a quick rise of the temperature in spring, while the maximum itself is not reached before the end of July, and in some places August is even warmer than July. The period of the rising temperature, therefore, is longer than that during which it falls.

This retardation of the maximum of the temperature is probably connected with the summer Monsoon of Texas. Owing, namely, to the calefaction and diminished density of the air in the interior, south-east winds are in Texas very regular during the summer, carrying the influences of the sea far into the interior.

Farther east on the coasts of the Gulf of Mexico, in Louisiana and Alabama, the climate is, upon the whole, more moderate; the winters are warmer, the summers cooler, and the changes of the temperature less abrupt. At New Orleans, for instance, January is by  $1\frac{1}{2}^{\circ}$  warmer than at Galveston, which is located  $\frac{1}{2}^{\circ}$  farther south and on an island. Still less are the differences between summer and winter on the Gulf coast of Florida, lying within the

immediate sway of the Gulf Stream, and these conditions culminate on the small island of Key West, the temperatures of which are already thoroughly tropical, viz.: Year  $25.1^{\circ}$ , January  $20.7^{\circ}$ , July  $28.8^{\circ}$ . But, little as the difference here is between January and July ( $8.1^{\circ}$ ), it is greater than at San Francisco, where it amounts to only  $5.3^{\circ}$ . Frost has never yet been observed at Key West; the absolute variation of the temperature amounts to only  $30^{\circ}$ , and is therefore even less than at San Francisco.

Notwithstanding the high mean temperatures of the winter months, the absolute maxima observed in Florida are not so high as in Texas; Key West, for instance, has in winter no more than  $31.2^{\circ}$ .

Mention has already been made of the region of the Upper Mississippi and the Red river of the North. This region has of late attracted very general attention because of the rapidity with which it is being settled, and because of the large quantities of wheat produced there. In the main, it is a prairie region, interspersed with small thickets. The climate is raw, the winter being especially cold, but the summer is warm and sufficiently rainy to favor the cultivation of the soil.

In the following table I present a comparison of this region with such parts of European Russia as are also distinguished by the extensive production of wheat:

| Degree of Lat.          | Altitude. (m) | N. America.                         | Year. | Jan.  | July. |
|-------------------------|---------------|-------------------------------------|-------|-------|-------|
| $45^{\circ}$            | 244           | St. Paul, Minn.....                 | 6.1   | -11.2 | 22.1  |
| $44\frac{1}{2}^{\circ}$ | 440           | *Ft. Pierre and Ft. Sully, (Dakota) | 6.9   | -11.3 | 23.9  |
| $46\frac{1}{2}^{\circ}$ | 300           | **Ft. Abercrombie & Breckenridge    | 3.8   | -16.0 | 21.4  |
| $50^{\circ}$            | 220           | Winnipeg, (Manitoba).....           | .4    | -20.5 | 19.1  |

\*On the Middle Missouri.

\*\*On the Red river.

| Degree of Lat. | Altitude. (m) | European Russia and West Siberia. | Year. | Jan.  | July. |
|----------------|---------------|-----------------------------------|-------|-------|-------|
| 51½°           | 60            | Saratow .....                     | 5.3   | -10.9 | 21.9  |
| 48½°           | 30            | Zarizin.....                      | 6.9   | -10.4 | 23.7  |
| 52°            | 110           | Orenburg .....                    | 3 3   | -15.3 | 21.6  |
| 65°            | 100           | Ischim, (West Siberia).....       | .1    | -20.1 | 18.9  |

Analogous temperatures of winter and summer are thus shown to prevail in East Russia and West Siberia about 6° farther north, but at elevations lower by about 150 m. The comparison of St. Paul with Ft. Sully establishes an increase in the temperature toward the west. Still higher are the temperatures in Montana, on the Upper Missouri, which, notwithstanding the elevation, are even warmer than those prevailing under the same latitudes on the Upper Mississippi and the Red river. This is ascribable in winter to the small quantities, or entire absence, of snow and to the frequency of "Föhns," and in summer to the aridity, which admits of an intense calefaction.

The region on the Mississippi, being rather flat and little elevated above the level of the sea, is exceedingly favorable for studies about the variation of the temperature with the latitude. The fact however must not be overlooked that the farther we move northward, the farther we advance also into the interior, so that, on the whole, a more continental climate must be found.

I have utilized, besides, the observation at Winnipeg, on the Red river, reducing the same to St. Paul, conformably with simultaneous deviations.

In the following table the temperatures are reduced to the sea-level, assuming a variation, per 100 m., of 40° in January, of 70° in July, and of 50° in the annual mean:



## VARIATION OF THE TEMPERATURE PER DEGREE OF LATITUDE.

| Degree of Latitude. |                          | January. | July. | Year. |
|---------------------|--------------------------|----------|-------|-------|
| 30-35               | New Orleans—Memphis..... | 1.50     | .02   | .91   |
| 35-41               | Memphis—Muscatine.....   | 1.71     | .78   | 1.12  |
| 41-45               | Muscatine—St. Paul.....  | 1.41     | .44   | .68   |
| 45-50               | St. Paul—Winnipeg.....   | 1.24     | .30   | .80   |

As far, therefore, as the observations reach, we must assume the decrease of the temperature towards the north to be more rapid on the Middle Mississippi than on its upper and lower courses. Everywhere, however, the decrease is much more rapid in winter than in summer.

I quote some figures relative to the temperature boundaries and ranges in the United States and in Southern Canada between  $24^{\circ}$  and  $50^{\circ}$  north latitude. The annual temperature is barely above  $0^{\circ}$  at the northern boundary, and  $25^{\circ}$  in Southern Florida. The January temperature varies from  $20^{\circ}$  on the Red river of the North, to  $20.5^{\circ}$  in Southern Florida. The zero temperature of January between the Mississippi and the Atlantic Ocean, is found under about  $39^{\circ}$  north latitude. The temperature of July is about  $14^{\circ}$  on the east coast under  $50^{\circ}$  north latitude, and  $34^{\circ}$  on the Lower Colorado. South of  $35^{\circ}$  north latitude, throughout the plains of the central and eastern parts of the United States, it is above  $27^{\circ}$ . This high temperature is accompanied here by a considerable air-humidity and by copious rains.

The annual range of the temperature is smallest on the coast of California ( $5.6^{\circ}$ ), which is chiefly conditioned by the extremely low summer temperature.

The whole west coast, inclusive of Sitka, has an annual variation of warmth of less than  $15^{\circ}$ , whilst in the central

and eastern parts of the United States, exclusive of Florida, it is everywhere higher than  $15^{\circ}$ , even on the banks of the Lower Rio Grande under  $26\frac{1}{2}^{\circ}$  north latitude. In the most southerly section of Florida, it is no less than  $8^{\circ}$  notwithstanding its genuinely tropical climate.

East of the Rocky Mountains and north of  $35^{\circ}$  north latitude, the variation is everywhere above  $20^{\circ}$ . On the Middle Mississippi it exceeds  $25^{\circ}$  and reaches its highest numerical expressions north of  $43^{\circ}$  north latitude between the Great Lakes and the Rocky Mountains. At Winnipeg it is  $39.6^{\circ}$ , scarcely greater on Grinnell Land, and even less in the most northerly part of Greenland and in the North American Archipelago, and this for the reason that in these regions the summer temperatures are considerably reduced by the melting of the ice.

The peninsulas and islands north of  $44^{\circ}$  north latitude have also a smaller range than the interior, and the annual variation of the temperature is moderated besides, by the Great Lakes.

In comparing Eastern North America with the coast region of East Asia, which it somewhat resembles in respect of climate, we find that Labrador has very nearly the same temperature as the shore of the Sea of Ochotsk under the same latitudes, which, in view of the fact that Florida is much warmer than South China, establishes even for East Asia a smaller decrease of the temperature towards the north.

In Europe and Asia, it is true, an almost equally rapid decrease of the temperature occurs in smaller territories, and this also principally in winter; but in all such cases a mountain range separating north and south, is the determining agency. Thus, very different temperatures are found, respectively, on the two sides of the Cevennes

Mountains, of the Alps, the Western Apennines (inclusive of the Sea-Alps), the Balkan, the Caucasus, etc.

In the Old World, therefore, such great differences in the temperature are found only where a positive, well defined geographical separation exists. The only larger country in Europe which is devoid of such mountain-ranges separating north and south, (Russia) has, indeed, the slowest decrease of temperature towards the north. Not so in the Atlantic and Mississippi region of North America. Here the isotherms crowd one another, as it were, without the instrumentality of a geographically separating mountain-range.

The great significance of this condition for man and his civilization lies in the fact that, by virtue of it, the fruits of the tropics and those of the polar regions are here produced within shorter distances from each other than anywhere else, whilst regions of such different climates and with such diversified products are, nevertheless, easily accessible to one another. With reference to its climate, Labrador must be counted amongst the polar countries. As in the High North, man is there dependent for his sustenance on the sea, the vegetable kingdom yielding him virtually nothing. Florida, on the other hand, at least the southern part thereof, although still north of the tropic, is decidedly tropical in point of temperature and vegetation. The following table exhibits the decrease of warmth per degree of latitude :

| Degree.    |                                 | Jan. | July. | Year. |
|------------|---------------------------------|------|-------|-------|
| 25¼ to 32  | Ft. Dallas-Savannah.....        | 1.50 | .19   | .86   |
| 32 to 36¼  | Savannah Portsmouth.....        | 1.90 | .05   | .67   |
| 36¼ to 39¼ | Portsmouth-Philadelphia.....    | 1.60 | .55   | 1.15  |
| 39¼ to 42½ | Philadelphia-Cambridge.....     | 1.40 | 1.08  | 1.17  |
| 42½ to 46  | Cambridge Houlton.....          | 1.59 | .64   | .91   |
| 46 to 55½  | Houlton-Hoffenthal, (Labrador). | 1.19 | 1.04  | .95   |
| 25¼ to 55½ | South Florida-Labrador.....     | 1.29 | .60   | .91   |

The decrease of warmth is consequently most rapid in winter.

In March the decrease of warmth with the latitude is nearly as rapid as in the winter months ; it is slowest in summer, whilst the other five months form the period of transition. As already observed, the difference from east to west is little perceptible in North America east of the Rocky Mountains. As regards the winter in particular, the temperature is, of course, milder on the coast of the Atlantic Ocean than in the interior, but even this influence is rather insignificant when compared with what we see in Europe. This is caused by the west winds, which are land-winds for the coast. The S. W. winds from the Gulf of Mexico, however, the warmest of all, bring warm air alike to the coast and to the interior. It is for this reason that we find in the interior of New England, at distances of from 100 to 200 km. from the ocean, winter temperatures as low as under the same latitudes on the Mississippi.

Only farther north, beyond  $45^{\circ}$  north latitude, a much colder winter prevails in the west, especially on the Red river. But the Lake region between New England and the Mississippi, is in winter warmer than either of these, owing to the influence of the enormous water masses. Thus, for instance, we find in January the following temperatures :

|   |       |
|---|-------|
| Houlton, Me. (interior of New England)..... | —9.7  |
| Ft. Brady, Mich. (Lake Region)..... ..      | —8.7  |
| Ft. Abercrombie or Red River Steppe.....    | —15.6 |
| Colebrook, Connecticut.....                 | —6.2  |
| Detroit, Michigan.....                      | —4.   |
| Dubuque, Iowa.....                          | —6.5  |

Concerning the cloudiness of the United States very few observations have, as yet, been made ; but it is certain that in the annual mean it is smaller than in Europe, with the exception of the countries around the Mediterranean

Sea. In the eastern and central parts of the United States, the annual variation is less than in Europe, while it is considerable on the west coast and on the western slope of the mountains, winter having here, as in the greater part of Europe, a heavier cloudiness than summer. On the Upper Red river, the annual period of cloudiness is similar to that of Middle Siberia.

In Chap. 2 I have adduced some figures relative to the duration of sunshine. They clearly show to how great an extent the American coast surpasses in this respect that of Europe, notably so, when we compare points of equal temperature located under different latitudes. And not only is the duration of sunshine greater, but the air is more transparent, particularly in the winter months. This contrast is most strikingly brought to our view in the course of a voyage from England to the United States.

In a large part of the Eastern United States, from the Atlantic Ocean to and somewhat beyond the Mississippi, and from the Gulf coast to  $43^{\circ}$  north latitude, the annual rain precipitations amount to more than 100 cm.

Nowhere on the earth in middle latitudes do we find again so extensive a territory with such considerable precipitations. Abundant rains during the warmer months, accompanied by a high air-temperature and rather ample humidity, account for the thriving of many plants, like cotton, sorghum, and maize. The first mentioned of these three products is, as is well known, the chief article of export of the Southern States, whilst maize is by far the most important bread-stuff of the United States. All three plants flourish only when a high temperature, combined with humidity prevails during the period of their growth.

For this reason maize ceases to be the principal cereal on the plateaus and on the west coast, where either the



whole year or the summer are too dry for the cultivation of that plant without artificial irrigation. Towards the west,  $100^{\circ}$  west longitude is considered as the limit of the region of abundant rains, in which the cultivation of the soil is remunerative without artificial irrigation.

The largest aggregate of precipitations in the United States is found on the coasts of Alaska and of Washington Territory and, next to them, on the coasts of the Gulf of Mexico, whilst the region of the greatest rain deficiency is found on the Lower Colorado, and many sections of the plateau region even much farther north, have annual precipitations of less than 20 cm.

The distribution of the precipitations over the single months may be summarized as follows: On the peninsulas and islands north-east of Newfoundland as far as Nova Scotia, autumnal rains predominate; on the coasts of New England and the Middle Atlantic States, rains are uniformly distributed throughout the year; on the South Atlantic coast, summer rains predominate, especially in August, and this the more, the nearer to Florida. In the interior, a greater predominance of summer rains is perceptible. In the wooded valley of the Hudson, the largest quantity of rain falls in July, whilst farther west, in the prairies of the Upper and Middle Mississippi and its right tributaries, June rains are prevalent. This region, has become noted as one of the granaries of Europe, to the markets of which it exports large quantities of wheat and maize. It must be remembered in this connection that in the steppes of Southern Russia, also, the greatest rain-fall occurs in June. In the territories of the Upper Mississippi and the Red river spring wheat preponderates, and this for the reason that the cold winter has not sufficient snow to protect the seeds from the frosts.

The cause of the great abundance of rain in the United States east of 100° west longitude, is to be found, firstly, in the warm basin of the Mexican Gulf lying south of it, and, secondly, in the violent agitation of the air caused in the north by frequent cyclones. The strong south winds bring warm and humid air, which, ascending near the centre, produces profuse rain and snow-falls.

In summer, and, in the Southern States, also in spring and autumn, the rains are frequently accompanied by furious thunder-storms to an extent which is unparalleled in any other country in middle latitudes. Not infrequently, also, the cyclones in the warmer months are accompanied by tornadoes, which, though raging within a limited circumference only, are nevertheless terribly devastating in their effects. Their course is usually from south-west to north-west, but always to the south-east of the centre of depression. They are most frequent in the Prairie States west of the Mississippi, viz.: Iowa, Kansas, Nebraska.

### 3. TROPICAL AMERICA. SOUTH AMERICA.

In this chapter I combine the whole of the American tropics with extra-tropical South America.

North of the Isthmus of Panama are located Mexico, Central America, and the islands of the West Indies. Countries of a more or less mountainous character predominate here, extensive plains being entirely absent, though some smaller ones exist on the Atlantic slope. Some mountains are high, but long and high mountain-chains trending in the same direction, like the Andes of South America, are wanting, and with them, also, the well-defined climatic lines of demarcation found in the latter country. But the manifold indentations of the country and the difference of elevation, produce, nevertheless, diversified climates

within short distances from each other. Long continued observations at many points would be requisite for obtaining exact data on this subject; unfortunately, however, but very few stations have been established.

Least of all do we know of the atmospheric pressure, especially in the interior, because good levellings have, as yet, not been taken. Upon the whole, the atmospheric pressure probably decreases towards the south, the same as in the same latitudes on the Atlantic Ocean, and the predominating air-current is the trade-wind of the Northern Hemisphere, (N. E., E.) With regard to location, however, these winds predominate chiefly on the islands and on the eastern slope of the continent, while they are much less prevalent in the interior and on the west coast, partly, because the trade-wind, originally a not very strong air-current, is considerably weakened by friction in the highlands, and partly, because of the neutralizing effects of local gradients. In the interior, especially on the vast, almost woodless plateau of Mexico, the atmospheric pressure during the greater part of the year is probably lower than on the ocean, a fact which is well calculated to attract winds from the Pacific Ocean. The following table shows this to be really the case:

|                 |                            | Summer.              |            | Winter.              |            |
|-----------------|----------------------------|----------------------|------------|----------------------|------------|
|                 |                            | Mean Wind-direction. | Resultant. | Mean Wind-direction. | Resultant. |
| Pacific Ocean   | 20°—25°N. Lat. 105°—115°W. | N. 67 W.             | 60         | N. 23 W.             | 48         |
|                 | 15°—20° " 110°—120°W.      | N. 20 W.             | 39         | N. 32 E.             | 82         |
|                 | 5°—10° " 50°—75°W.         | S. 47 W.             | 58         | N. 28 W.             | 30         |
| Monterey        | Mexico.....                | S. 41 E.             | 82         | N. 33 E.             | 33         |
| Vera Cruz       |                            | N. 78 E.             | 21         | N. 22 E.             | 37         |
| Guatemala, City |                            | N. 32 E.             | 41         | N. 41                | 76         |
| Havana, Cuba    |                            | N. 80 E.             | 70         | N. 69 E.             | 68         |
| Barbadoes       |                            | N. 88 E.             | 87         | N. 76 E.             | 89         |

Everywhere, then, with the exception of the Pacific Ocean

from  $15^{\circ}$  to  $20^{\circ}$ , and of Havana, the mean wind-direction is more southerly in summer than in winter. In the preceding chapter this has been shown to prevail also in an extensive region of the United States, and there traced to the diminished density of the air in summer over the interior of that country.

On the Pacific Ocean from  $5^{\circ}$  to  $10^{\circ}$  N. latitude, this diminished density of the air in the interior of the country, produces in summer a south-west Monsoon.

The difference of the temperature on the sea-coast in the region here under consideration, is slight, particularly in the annual mean. It rises here everywhere above  $26^{\circ}$ , and even beyond the tropics, in Northern Mexico, it is not under  $22^{\circ}$ . It is therefore, for the most part, the heights only which give rise to a greater difference, to which is added, in the warmer months, the difference between sea and land. Where the latter is dry, because protected from the influences of the ocean, high temperatures are developed, as especially in the environs of the Gulf of California. These, however, are already located north of the tropics, which exhibit no such high temperatures, so that the annual range is not above  $8^{\circ}$ , not even on the arid Mexican plateau, but mostly less.

As everywhere in the tropics, the temperature on this expansive elevation is higher than in mountains of the same altitude, so that between Vera Cruz and Mexico the temperature shows, per 100 m., a decrease of  $.41^{\circ}$  in the annual mean, of  $.43^{\circ}$  in January, and of  $.37^{\circ}$  in May. The smaller plateau of Guatemala is relatively less warm, and the decrease of the temperature with the elevation equals  $.53^{\circ}$  per 100 m. in the annual mean.

On the Mexican plateau the rainy season extends from June till October, being the regular period of rains in the

tropics ; the other months are measurably dry and have but a light cloudiness. On the Pacific slope, the rains more and more diminish in duration and quantity up to 30° north latitude, where an all but rainless belt exists. Differently conditioned is the east slope of the plateau ; here the rains are more plentiful, and besides the regular tropical ones, there are rains from November till April of an entirely different character, being "fog-rains," which yield but little water. They fall while the Nortes are blowing which occur here at times, and which bring cold and rain not only here, but also as far south-east as the mountains of Honduras. The fluctuations in the temperature are, therefore, much greater here than elsewhere in the tropics. At Vera Cruz, as at Havana, there are nearly every winter minima of 13°, occasionally even of 10°, and at a short distance north of the tropics, the temperature falls below zero. The "Nortes" are yet vehement on the southern slope of the Isthmus of Tehuantepec, where, however, they are dry and less cold.

These regions, as also the coast and the western slope of the mountains, are known to me of my own knowledge. On the isthmus, the rainy season is short, lasting about four months ; the other months are very dry, and the wild vegetation is by no means luxuriant. It becomes more and more so, however, as we advance towards the east, and at Socunusco, on the frontier of Guatemala, we find one of the most beautiful tropical vegetations. The humidity of the climate is characterized by the oak-ferns which are found here. The rainy season is here longer than on the isthmus ; in winter, rains are rare, though fogs are frequent. The most violent "Nortes" do not penetrate into this section, being intercepted by the wooded mountains. The humidity of the climate unquestionably depends to a great



extent upon the dense forests, for, considering the conditions in general, the western mountain slopes in these regions are dryer than those in the east. Very humid, also is the adjacent west-coast of Guatemala ; much less so is the plateau, as also San Salvador and Nicaragua. From Humboldt's beautiful description it has often been inferred that this condition uniformly prevails throughout the tropics. But the more we become acquainted with the tropics, the greater is the manifoldness we discover in the tropical climate, especially in the hydro-meteors.

My knowledge of the rainy season of Soconusco and Guatemala is derived from personal observations. I found that the rains are there by no means confined to the daytime, as on the Orinoco, and that the nights and mornings in the rainy season are very far from being always clear. In addition to the rains accompanied with thunder-storms, there are also so-called "land-rains," which fall unremittingly for twenty-four hours, and which are at times not heavier than our autumnal rains. That the inhabitants have attached a specific name (*temporal*) to these rains, proves the latter to be not altogether exceptional.

The eastern slope of Central America is more moist and rainy than the western one. This produces an exuberant vegetation, and this not only on mountains and coasts, as at Soconusco, but also on plains. The trade-winds prevail here during the larger portion of the year ; coming, as they do, from across the warm Caribbean Sea, they are naturally laden with vapors. March and April are relatively dry, probably because the water is then colder ; in October the rains are especially abundant, the waters being at that time colder than the land. This character of the rains prevails also on the Lesser Antilles. On some of the Antilles, numerous observations of the rain have been made, espec-

ially on Barbadoes. On the northern and eastern slopes, which are altogether more moist, the trade-wind brings rain, even in winter ; on the southern and western slopes, most of the rains accompanied with thunder-storms fall during the warmer months.

It has often been asserted that, normally, the vicinity of the tropics has but one rainy season, whilst nearer to the equator a double one is the rule. In tropical monsoon-regions of the Northern Hemisphere, like South Asia, West and Central Africa, this is indeed the case, but the very reverse obtains on the Antilles. In the north, between  $17^{\circ}$  and  $23^{\circ}$  N. latitude (Cuba, Porto Rico, Hayti, Jamaica) there is a twofold rainy season, viz: in May, and September and October, whilst June and July are comparatively dry ; on Barbadoes ( $13^{\circ}$  N. latitude) August and October are the rainiest months, September having somewhat less rain ; on Trinidad ( $10\frac{1}{2}^{\circ}$  N. latitude) there is a well-marked single rainy season with regular increase from March till October, and decrease from October till March. All the rain-measurements on the Antilles indicate, likewise, that the winter months are there by no means rainless. Even in the south of mountainous Jamaica, that is, under local conditions which are certainly unfavorable to winter-rains, 3 per cent. of the annual rain-fall occurs in February, the least rainy of all the months.

South America bears a general resemblance to North America in the outlines of the continent, each forming a triangle with its vertex turned southward, and in the location of the highest mountain-chains in the west. Even the relative position of the Appalachian Mountains and the Canadian plateau on the one hand, and of the mountains of Brazil and the plateau of Guayana on the other, are analogous. But this analogy between the two continents is attended by essenti-

ally different effects upon their respective climates owing to the fact that South America broadens in the tropics, and North America in the middle and higher latitudes.

Moreover, the high mountains of South America are shoved still more to the west, forming an uninterrupted high wall from  $10^{\circ}$  north latitude to far beyond  $30^{\circ}$  south latitude. In this respect, no mountain range surpasses the Andes, and none forms such a sharp climatic boundary-line between east and west. As the western slope comprehends no more than  $\frac{1}{20}$  of the continent, the eastern one is open to the influences of the Atlantic Ocean. This is of special importance for the tropics, because by reason of these geographical features, by far the greater part of the continent is open to the sweep of the trade-winds. Hence, the climate of South America from  $10^{\circ}$  north latitude to  $20^{\circ}$  south latitude, and from the Atlantic Ocean to the eastern crest of the Andes is, in the main, a maritime climate, characterized by the predominance of a truly oceanic air-current (the trade-wind), by great uniformity of the temperature, by limited variations of the latter, both periodical and non-periodical, and by considerable humidity. Thus, the openness of the continent towards the east neutralizes to a great extent the influence of its bulk.

Very little is known, as yet, about the atmospheric pressure, and the drawing of the isobares in the interior is rendered difficult by the small number of stations, and besides, by the want of levellings determining the elevations. The following table affords an idea of the winds in the north of South America :

## JUNE, JULY, AUGUST.

|                         | N. | N. E. | E. | S. E. | S. | S. W. | W. | N. W. |
|-------------------------|----|-------|----|-------|----|-------|----|-------|
| Northern Venezuela..... | 2  | 45    | 23 | 13    | 3  | 6     | 5  | 3     |
| Dutch Guiana.....       | 4  | 60    | 13 | 11    | 1  | 0     | 2  | 10    |

## DECEMBER, JANUARY, FEBRUARY.

|                         | N. | N. E. | E. | S. E. | S. | S. W. | W. | N. W. |
|-------------------------|----|-------|----|-------|----|-------|----|-------|
| Northern Venezuela..... | 6  | 17    | 32 | 22    | 8  | 9     | 4  | 0     |
| Dutch Guiana.....       | 3  | 41    | 22 | 24    | 5  | 4     | 0  | 1     |

This shows the trade-wind to be more regular in Guiana ; here, as in Venezuela and on the Antilles, the wind-direction in summer is more southerly. This evidently indicates that in the summer of the Northern Hemisphere, the zone of high atmospheric pressure in the western part of the ocean is located more to the north ; furthermore, that the influence of the diminished density of the air in the interior of the United States extends to this region, and, finally, that a lower atmospheric pressure probably obtains then also in the interior of the most northerly portion of South America.

The coast-belt of Guiana is very rainy notwithstanding its being a plain, the annual rainfall ranging from 230 to 350 cm. The distribution through the months is here, as on the Antilles, very unequal, and this, chiefly, because September and October are the driest months. The same conditions prevail at the mouth of the Amazon.

It is probable that the dense forests of Guiana are likewise conducive to the cooling of the air and the increase of precipitations. In the vicinity of Guiana and the forests of the Upper Orinoco, there lie, on the left bank of the river, the steppes called "Llanos," the climate of which has become so well known to us through Humboldt's classical description. April and May undoubtedly exhibit here the highest temperature of South America ; the grasses wither, and the soil is rent by deep fissures. In consequence of the diminution of cattle breeding during the last fifty years, the Llanos are now dotted with isolated clumps of trees and

small groves, so that Jonas\* could nowhere find a complete steppe horizon. There are also at present more clouds during the arid season than at Humboldt's time, and, now and then, even more rain. A slight change in the vegetation has thus already exerted an influence upon the climate.

West of these Llanos, there are, besides, extensive steppe districts in South America, north of the equator. Some of these districts, chief amongst them the shores of Lake Maracaybo and part of the valley of the Magdalena river, are noted for their great heat.

On the Amazon river and its tributaries, there exists what is probably the most luxuriant vegetation on earth. The larger part is still forest, and, being connected with the forests of Guiana and stretching for long distances along the east declivities of the Andes, it is, next to the Siberian Taëga, the most extensive forest-zone on the earth. Unfortunately, the observations of the climate of the Amazon river are few, but the deficiency is made up for by excellent descriptions. On the principal river, east winds predominate during the greater part of the year, notably in the dry season, from November till May, when they are rather strong.

On the Rio Negro and the Orinoco, on the other hand, the winds are moderate, and calms frequent. From this fact the conclusion has frequently been drawn that the zone of equatorial calms obtains here throughout the year. But in Chapter XXI it has already been pointed out that even on the western part of the Atlantic Ocean, this zone is narrow and shifting in location in the course of the year. The matter must probably be referred to the easy access offered by the wide estuary of the Amazon to the winds, which thence advance farther up the valley. In the lateral

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\*Peterman, Mittheilungen, 1879.



valleys, however, we find again temperate winds. The direction of the valleys of the Upper Rio Negro and Orinoco is nearly rectangular to that of the predominating winds, and between them and the ocean intervene hundreds of kilometers of dense forests, which diminish the force of the winds, especially of those of the Parime mountains (more correctly, "Parime Plateau").

I have already adverted to the bearing of the dense forests on the Upper Amazon on the reduction of the temperature and on the increase of precipitations. (Chapter 13.) There certainly exists here an interdependence of cause and effect. The abundant rains conduce to a luxuriant forest-vegetation, which, on its part, is instrumental in increasing the precipitations. I must add that on the Upper Amazon the winds are S. E. and E. during the dry season, but variable during the rainy season, when calms and N. W. winds are of frequent occurrence. Phenomena, however, partaking of the nature of monsoons, do certainly not occur here, and, altogether, the mutual connection between the phenomena is, as yet, to a great extent obscure to us. The water of the Amazon river has a very variable level, and even at Ega, near the frontier of Peru, the high-water is by 40' (14 m.) higher than the low-water, although the country is there so level as to render possible overflows by the river for miles.

Our present information concerning the coast and the interior of Northern Brazil east of the Amazon river, is limited. The oft-quoted rainfall of over 700 cm. at Maranhão is surely incorrect. The province of Ceara, farther to the east, is noted in Brazil for the periods of drought occurring there. (Draenert "Journal for Meteorology," Vol. III. Page 381.) It seems, however, that this drought prevails principally in the interior, the city of Ceara having the rather ample

rainfall of 149 cm. annually, which is but little less than that at Para. It must be observed, though, that Ceara has for four successive months a rainfall of less than 2 cm. per month, whereas at Para this is the case for one month only. At Pernambuco the rainy season is the very opposite of what might have been expected on the Southern Hemisphere. The largest quantity of rain falls in July, the smallest in November and February, whilst at Bahia, as at Para and Ceara, April is the rainiest month. In Guiana also, the period of rain is essentially the same, and this conformity between the two sides of the equator is most remarkable. The explanation of this phenomenon is perhaps to be found in this, that the low atmospheric pressure probably prevailing during these months in the highly heated Llanos of the Orinoco, more effectively attracts the warm air of the ocean, thus causing abundant precipitations. In the interior of Northern Brazil, under  $8^{\circ}$  and  $9^{\circ}$  north latitude, the quantity of rain (100–110 cm.) is very small for a tropical country, and the period of rain is the same as at Pernambuco. The trade-wind is exceedingly strong on the coast of Bahia, and even more so on that of Pernambuco and at the mouth of the San Francisco river.

Farther south, particularly in the neighborhood of Rio Janeiro, the climate is, upon the whole, moist, though much less rain is precipitated than at Pernambuco. The heights to the east of the Bay probably shut out part of the rain-winds. On the ridge of the coast-mountains in the provinces of Rio Janeiro and San Paulo, the rain-quantity is larger. But while west of them the rainfall is more limited, it is nevertheless incorrect to regard this region as very arid, (as does, for instance, Griesebach in his "Vegetation of the Earth"), and to ascribe the absence of unbroken forests to this circumstance. The existence of coffee plan-

tations without artificial irrigation, as well as some rain-measurements, prove the rain-quantities of this region to be by no means inconsiderable, especially from November till March, though the months from June till September are dry.

Of the remaining part of the interior we know very little. In the swampy plain at the sources of the Paraguay and Madeira rivers,  $20^{\circ}$  to  $21^{\circ}$  S. latitude, the plentifulness of water and the luxuriant vegetation indicate copious precipitations; here palms largely preponderate. In like manner does a rich vegetation point to abundant rainfalls on the whole eastern slope of the Andes from about  $20^{\circ}$  S. latitude to  $10^{\circ}$  N. latitude. The vegetation is not only exuberant, but also exceedingly diversified, and varies materially with the altitude. Amongst others, the quinine tree has here its home.

The tropical Andes are, next to the Himalaya and some neighboring mountain chains of High Asia, the highest mountain-range of the earth. They differ from the Himalaya in this that their two slopes descend, respectively, to the ocean and to low plains. With the warm climate and the ample irrigation of the mountain sides in the proximity of the equator and the adjoining plains, the Andes have become the classic example of the influence of the elevation on the vegetation, for they reach from regions where the vegetation is the most exuberant on earth, up to heights which are utterly destitute thereof. The Andes are classical, also, by having furnished to Humboldt the well known illustrations of the variability of the vegetation in mountainous regions, which have since been incorporated in educational text-books and other popular works.

In the high regions of the Andes, beyond the forest boundary ("paramos"), the winds are very high and, at the same

time, blowing from different directions. At times they increase to the force of dangerous gales ; this is of particularly frequent occurrence on clear and warm days below the snow-fields. In such cases the air-strata are undoubtedly in an unstable equilibrium, wherefore these winds may be compared to the "Bora" of the Adriatic and of the Black Sea.

The Andes in the tropics consist of several parallel chains, and the wide longitudinal valleys between them are inhabited up to considerable heights. These colossal elevations have a relatively warm climate, or, in other words, the decrease in the temperature from the sea-coasts up to them, is comparatively slow, whilst from these highland valleys upwards, towards the higher regions of the mountains, the temperature falls very rapidly. (Chap. 11 Quito-Antisana). These interior highland valleys exhibit a very uniform annual progression of the temperature and have, moreover, considerably less rain than the whole eastern slope of the tropical Andes and the western slope north of  $4^{\circ}$  south latitude. The absence of extensive forests, and the intense heat imparted by the sun to the rocks on the valley-sides, offer, for the most part, the explanation for the high temperature of these valleys. From the latter upwards, however, there are, on the one hand, many clouds which intercept the rays of the sun, whilst, on the other, a large afflux of air from the exposed heights takes place, which has a refrigerating effect.

West of the Andes, between  $10^{\circ}$  north and  $4^{\circ}$  south latitude, the climate is again very moist, rains are frequent and profuse, and the vegetation is scarcely inferior to that of the Amazon. The river Atrato, flowing in this section, has, notwithstanding the smallness of its territory, an amount of water equal to that of the great rivers of Europe, with

the exception of the Volga and Danube. Near  $4^{\circ}$  S. latitude, a pronounced climatic boundary-line exists, south thereof being an almost rainless region ; this is mainly effected by the cold Humboldt-current, flowing along the coasts of Peru and Chili, between  $30^{\circ}$  and  $4^{\circ}$  S. latitude, thence branching off towards the west, in the direction of the Galapagos Islands, giving the latter the coldest climate known in these latitudes. For, according to Wolf, the air-temperature at the level of the sea is but  $22^{\circ}$ , and that of the surface of the sea,  $23^{\circ}$ . The temperature rapidly decreases with the height, so that the same observer found at an elevation of 700 m. but  $14^{\circ}$  at noon, with a high south-east wind and dense fogs. The lower region of the islands is very arid, rains being very rare ; higher up, nearly constant fogs prevail, which gradually turn into drizzling rain. The moisture is here so considerable that the upper stratum of basaltic lava has been disintegrated thereby and converted into argillaceous soil. (T. Wolf, *Apuntos, so birel clima de las islas Galapagos*, Quito 1879.)

The coasts of Peru and Northern Chili, and the adjoining ocean have, along with South Africa, the lowest temperatures of corresponding latitudes. It is not only the cold ocean-current which is decisive in this direction, but also the south winds blowing from the region of higher atmospheric pressure to about  $30^{\circ}$  S. latitude. The air brought by these winds into the lower latitudes is colder than the temperature of the adjacent ocean. As long as they alone are blowing, the sky is mostly serene, rain occurring at most once in every 20 to 30 years. During the three to four colder months, the winds are variable, partly blowing also from the north, and from the sea upwards, to an elevation of about 1000 m., dense fogs prevail, which pass into misty rains. The fogs are not denser on the ocean, but at some elevation



on the hills, which then drape themselves in scant verdure. The fog-region is rather sharply delimited towards the interior, and at a short distance from Lima, for instance, the salubrity of the valleys is such as to render them available as climatic health-resorts for patients to whom the moisture of the coast-belt is an element of injury.\*

Between  $5^{\circ}$  and  $16^{\circ}$  S. latitude the chain of the Andes is very distinctly bounded, and beyond the narrow coast-belt rains occur in summer and, in the higher regions, snow. The water flowing from this source down the mountains, serves the purpose of irrigating the fields and gardens of the coast-region. The inadequacy of this rain-supply, however, is sufficiently indicated by the complexion of the vegetation, in which cacti and other plants of dry climates predominate.

Farther south, between  $16^{\circ}$  and  $30^{\circ}$  south latitude, the western ridge of the Andes assumes more the character of a plateau; the aridity is here still greater, so that, within this whole tract but one small river reaches the sea. Above the coast-belt, with its hibernal fogs, plateaus are found here, on which several years intervene, sometimes, between one rain and another. Such is the plateau of Tarapaca, from 1000 to 1500 m. high, noted for its rich deposits of nitre and borates, and, farther south, the desert of Atakama, about 3000 m. high. The plateau west of Titicaca Lake, which is partly upwards of 4000 m. high, has in summer regular rains and snows, the latter of which, however melts in a short time. In winter the sky is clear, the air exceedingly dry, and the daily range of the temperature very great. Both in this respect and in point of elevation, this plateau presents an analogy to that of Thibet, though, owing to the low

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\* The best authority for the climate of this coast is, "Contributions to the Meteorology of Cape Horn," etc., London, 1871.

latitudes, the winter on the former is decidedly warmer. Meteorological observations extending over, somewhat more than a year, have been made on this plateau, at Huancacho, at an elevation of 4100 m.; the mean annual temperature is about 8°, with considerable difference between the months of October and June, the former being the warmest, the latter the coldest month. Of 411 days, 251 were dry and stormy, 75 dry and calm, and 85 had precipitations, of which 59 occurred from January till March, again conditions, therefore, which undoubtedly call to mind, those of Thibet, by the frequency of storms and the predominance of precipitations in summer. In these latitudes, and a little further south, the elevation of the Andes as a whole is broader, and plateaus of greater extent, to the east of them, are found also. At Sucre, the capital of Bolivia, 2840 m. high, a period of 321 days showed 111 days with rain, 77 of which were between November and March; thus, here too, summer-rains largely predominate.

Concerning the climate of Chili we are somewhat better informed than concerning that of Peru and Bolivia, and here we have, moreover, observations of the atmospheric pressure on the mainland. Upon the whole, Northern and Central Chili have a high atmospheric pressure, and the annual mean is everywhere above 762 mm. In Northern Chili the atmospheric pressure is in midwinter by 4 mm. higher than in midsummer, whilst in Southern Chili the difference ranges from 1 to 1½ mm. From 40° S. latitude southward, the atmospheric pressure rapidly diminishes, a condition which is altogether peculiar to the higher latitudes of the Southern Hemisphere. In these latitudes, furthermore, W. and N. W. winds begin to prevail, the moisture and relative warmth of which cause the rains farther south to become more and more abundant. At Copiapo, under 27° S.

latitude, the annual rainfall is equal to 1 m., whereas at Puerto Montt, under  $41^{\circ}$  S. latitude, it amounts to 269 cm. In Northern and Central Chili south winds are yet predominant in summer, in consequence of which that season is almost or entirely, rainless, especially, since the sea has here a colder temperature. The other seasons, however, have rain, particularly autumn and winter.

In many respects the climate of Central Chili is analogous to that of California and Italy. Wheat and barley are here, as in the latter countries, the principal products and are grown, likewise, without artificial irrigation, whilst the latter cannot be dispensed with in the cultivation of herbage and vegetables. The vine and the fruit-trees of Southern Europe are also found here, though the orange, for instance, does not ripen here, the summer being much cooler than in Italy and in the interior of California. The cloudiness is slight in Northern Chili (Copiapo: 19 annually); on the coast it is much heavier, and in Central Chili it has a considerable annual range, to-wit, 22 in January and 56 in June.

On the coast of Northern Chili the temperature is depressed in a marked degree by cold winds blowing from the ocean, whilst in the interior the rocky soil is exceedingly favorable to calefaction. Owing to these facts the temperature rises in the direction of the interior, up to a considerable height. Thus, for instance, we find between  $27^{\circ}$  and  $28^{\circ}$  south latitude the following annual means: Caldera (coast)  $19.5^{\circ}$ , Copiapo (400 m.)  $16.5^{\circ}$ , Pabellon (670 m.)  $17.3^{\circ}$ , Potrero Grande (850 m.)  $19^{\circ}$ . Assuming the temperature to decrease from the last named altitude by  $.55^{\circ}$  per 100 m. elevation, the temperature at the height of 1300 m. would still be no lower than on the coast. In California the same phenomenon is observed, but prin-

cipally in summer, whilst in the annual mean the temperature does not increase up to such elevations.

South of  $42^{\circ}$  south latitude we have no observations of the rain on the west coast of South America, but the appearance of the vegetation, and the accounts of travellers, concur in arguing an exceeding abundance of rain. Such, too, is the judgment of Darwin, King, Fitzroy, and others. Autumn and winter rains probably predominate as far as  $45^{\circ}$  south latitude, whilst farther south the rains are more evenly distributed over all the seasons of the year. In keeping with this profusion of precipitations is the quantity of snow found on the western declivities of the Andes; mighty glaciers are formed accordingly, one of which extends in the Lagoon of S. Raphael ( $46\frac{1}{2}^{\circ}$  south latitude) down to the sea-level.

As in South Africa, so also in South America, the west coast is considerably colder than the east coast. We are, alas, without observations regarding the section from  $4^{\circ}$  to to  $18^{\circ}$  S. latitude, where the difference is probably greatest. At Rio Janeiro, under  $23^{\circ}$  S. latitude, the mean temperature is by  $4^{\circ}$  higher than at Arica, in Peru, located under  $18\frac{1}{2}^{\circ}$  S. latitude. In the latter latitude on the coast of Brazil, the mean temperature is probably by  $5^{\circ}$  higher than at Arica. At Bahia-Blanca, on the east coast under  $39^{\circ}$  S. latitude, the mean temperature is by only  $4.5^{\circ}$  lower than at Arica, whilst its summer is even by  $1.1^{\circ}$  warmer.

Until recently we knew virtually nothing about the temperature in the interior of the Argentine Republic. At present, however, quite a number of stations are to be found there, and three years ago B. A. Gould projected a chart of the isotherms of South America. The limited number of observations, however, and the plateau-like elevation in the north-west of the country, render the isotherms rather doubt-

ful. Their general course is as follows : From the coasts of Chili they turn abruptly to the south, reach their most southerly location on the plateaus east of the Andes, and shift again somewhat to the north in the vicinity of the east coast. Thus, the course of the isotherms in the eastern and central parts of South America, resembles, in a great measure, that in the United States. Here also does the temperature of the western plateaus, when reduced to the sea-level, exceed that of the eastern lowlands ; at Pilciao, for instance, located in the west at an elevation of 800 m., the summer is no cooler than under the same latitude in the plains of the Parana.

For want of requisite means, we are, as yet, not in a condition correctly to draw the isobares in the interior of South America. Although observations have been made of the atmospheric pressure, the height of the latter is not definitely known to us. The assumption is warranted, however, that in the interior of the country, between  $30^{\circ}$  and  $35^{\circ}$  S. latitude, the isobare 768 mm. is to be found in winter, whilst that of 757 mm. probably obtains in summer, and this for the following reasons: 1. It is peculiar to the interior of continents in middle latitudes to have a much lower atmospheric pressure in winter than in summer; 2. Though not specially broad south of  $30^{\circ}$  S. latitude, the South American continent between  $30^{\circ}$  and  $39^{\circ}$  S. latitude extends, nevertheless, over 15 degrees longitude east of the Andes, and, being protected by high mountains against the west winds prevalent in these latitudes, its climate is more continental than it would be if exposed to the sea winds blowing from the west; 3. In the interior of the Argentine Republic and Paraguay, between  $25^{\circ}$  and  $30^{\circ}$  S. latitude, the temperature in summer is higher than that of any month on the Amazon. 4. At Buenos Ayres



already, the atmospheric pressure of July is by 5 mm. higher than that of January. At Pelotas in Southern Brazil, at a short distance from the coast, the difference amounts to no less than 9 mm.; a difference of 11 mm. in the interior, when reduced to the sea-level, would, therefore, be no extraordinary phenomenon.

South America, south of the tropics and east of the Andes is by the latter mountain range cut off from the west winds which are the rule in middle latitudes, and for this reason calms occur frequently on the eastern base of the mountains, as, for instance, at Mendoza.\* But on the eastern plains and on the east coast, the winds are rather high, and the warm north winds are, therefore, shortly superseded by cool, humid, southeast (Su Estada), and by dry cool southwest winds (Pampero), and *vice versa*. This is attended with pretty rapid changes of the temperature, especially in summer, as is also the case in the Eastern United States.

But this similarity between the Eastern United States and the Argentine Republic does not reach very far, the climates of the two countries being essentially different, notably in winter. Eastern North America widens towards the north, *i. e.* towards the pole; in the High North the winter is very cold, and the plain of the United States is completely open both to the cold dry winds from the north, and to the warm winds from the Gulf of Mexico. In South America, the opposite of these conditions prevails. The continent does not extend into higher latitudes and becomes more and more narrow as it approaches the pole, so that regions of winter-colds, as intense as those found in North America, are here entirely absent. Throughout South America, therefore, east of the

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\* Burmeister : Description physique de la République Argentine.

Andes, the temperature of the coldest month is nowhere, on the plains, and not even the plateaus, below  $-1^{\circ}$  or  $-2^{\circ}$ . Hence the country is exempt in winter from that extreme cooling through winds from high latitudes which is so pronounced a feature in the United States. The winter is everywhere in South America south of  $30^{\circ}$  south longitude very moderate, and, as far as known, a permanent snow-crust is found nowhere in that season, not even on the plains of Patagonia. There exists, moreover, in the proximity of the Argentine Republic no warm sea-basin like the Gulf of Mexico, and the variations of the temperature in winter from day to day, are, therefore, less wide than in summer, and much more limited, especially, than anywhere in the United States. (*Vide* the admirable investigations of this subject by O'Doering "La Variabilidad Interdiurna de la temperaturain America del Sur" Buenos Ayres. 1883.)

But the fluctuations of the temperature are here greater, nevertheless, than on the west coast of South America, so that as far as  $30^{\circ}$ , and here and there as far as  $26^{\circ}$  south latitude, night frosts occur occasionally at a short distance from the coast. In the valley of the Parana snow falls to about  $30^{\circ}$  south latitude, though this is a rare occurrence.

The rain-quantity in Southern Brazil, the Argentine Republic, and Paraguay, from the tropic to  $30^{\circ}$  or  $32^{\circ}$  south latitude, and east of the Parana, is rather large, viz.: 100 cm. and more; farther south it grows smaller, being 87 cm. at Buenos Ayres, 49 cm. at Bahia-Blanca, and still less, probably, in Eastern Patagonia. But in the city of Buenos Ayres and the surrounding district, the precipitations begin to be very variable, and years of very destructive droughts are occasionally experienced. West of the Parana, the

climate grows more and more dry, the rainfalls are limited, and, as we advance, we find heavier rainfalls confined to isolated climatic oases, all of which are located on the east slope of mountain-groups, at whose sides the more humid E. and N. E. winds ascend (*i. e.*, Tukuman 90 cm., Kordova 69 cm.) Between the coast or the Parana, and the Andes, several mountain-groups of this kind are to be found, and the Argentine slope of the Andes north of  $40^{\circ}$  south latitude is, consequently, very arid. Farther south this is not the case to the same extent, as, owing to the decrease in the elevation of the Andes their eastern declivities receive larger quantities of rain. Between  $22^{\circ}$  and  $32^{\circ}$  south latitude, however, both slopes of the Andes, and the contiguous plateaus, are exceedingly dry.

Until a very short time ago, it was currently believed in Europe that the distribution of rain throughout South America between  $25^{\circ}$  and  $40^{\circ}$  south latitude, is subtropical, which means a rainless summer and rains during the colder months. At present we know this distribution to prevail only in Chili, but nowhere east of the Andes, *so that South America east of the Andes and south of the tropic is a region of strongly predominating summer-rains.* This applies particularly to the interior. We have at present observations from more than twenty points in the interior, and everywhere the same distribution is exhibited, with widely varying rain-quantities. The coast and its vicinity (Buenos Ayres, the valley of the Parana), shows a slightly different distribution, the precipitations being heavier in spring and autumn, but even here the smallest quantity of rain falls in the winter months.

There are reasons for regarding what has been observed in this part of South America as the normal continental conditions of middle latitudes. The interior of the

continents on the Southern Hemisphere present altogether similar conditions.

In the highest latitudes of South America, and in the neighboring islands (Terra del Fuego, Falkland Islands), the rains are much more evenly distributed through the months. The annual aggregate is not large, about 50 cm., but the rains are frequent, the air is humid, and the cloudiness considerable.

At Ushuaya (Terra del Fuego), July has a temperature of  $-6^{\circ}$ , while that of January exceeds  $10.6^{\circ}$ . The French polar station in Orange Bay, west of it, found the conditions much less continental. At both points the mean annual temperature was about  $5.4^{\circ}$ , which clearly indicates that the most southerly portion of South America, and Terra del Fuego, have a relatively warm climate. A much colder temperature at the same time was observed on South Georgia, where the German polar expedition passed the winter, and which is located under the same latitude as the French station.

The following collation presents some of the results :

|                             | Orange Bay, French Station,<br>on Terra del Fuego. | South Georgia. |
|-----------------------------|--|----------------|
| Annual mean.....            | 5.4  | 1.4            |
| Coldest month, (June).....  | 2.3  | -2.9           |
| Warmest month, (Feb'y)..... | 8.9  | 5.3            |

South Georgia is in every month of the year much colder than Orange Bay, but the difference of the temperature of the coldest month is greater than that of the warmest, and in the annual mean it amounts to  $4^{\circ}$ , which is certainly considerable, in view of the fact that the Southern Hemisphere is principally covered with water.

In conclusion I have to make one more observation : On the Paramos (plateaus) of the Andes, beyond the height of

3000 m., a high west wind is observed everywhere, especially in the daytime. The same phenomenon has been observed, also, in other regions, as, for instance, in Thibet, where it has been explained by assuming it to be the air of the plains and lower table-lands located to the west of it, which rises to these heights in the middle of the day, owing to the ascent of the strata of equal atmospheric pressure. For the Andes this explanation is not admissible, because west of them lies the cool eastern part of the Pacific Ocean, and the equally cool coast region. I think it more probable that these west winds are a part of the general westerly current prevalent on high elevations, and the fact of their being more pronounced at daytime, must be referred to the same cause which increases the force of all winds on heated land-areas.

#### 4 THE ATLANTIC OCEAN.

Of all the oceans of the globe, the Atlantic has been most thoroughly explored. For a long period of time it has served as the highroad of commerce to civilized nations, so that many facts concerning it have been gathered, many practical experiences acquired, before the oceans were made the subjects of systematic scientific investigation. Of late years, many expeditions have been specially equipped for this purpose, and a considerable portion of the materials thus collected bears exclusively on the Atlantic Ocean. Apart from its having been more closely examined into than other oceans, the Atlantic has certain peculiarities rendering its exploration singularly important. Although its dimensions, at least in width, are not considerable when compared to those of the Pacific and Indian Oceans, it presents, nevertheless, a very expansive scope to the winds, by reason of its being devoid of islands, save such as are located near the shores of the continents, and



the trade-winds of the Atlantic, if no other, yield not in the least to those of other oceans in regularity and force. Furthermore, the Atlantic Ocean stretches over all the tropical and a large part of the middle latitudes of both hemispheres, and stands in open communication with both the Arctic and the Antarctic Ocean, being thus in a condition to receive cold water from both. The Pacific and Indian Oceans have such communication with the Antarctic Ocean only; with the Arctic Ocean the Pacific connects by means of the relatively narrow and shallow Behrings Strait, whilst the Indian Ocean barely reaches to the northern tropic.

There is, finally, one more feature in the Atlantic Ocean by dint of which it must needs exert a most potent influence on the climates of the globe, and which, therefore, greatly enhances the value of the exploration of the same; it is this: While itself much smaller than the Pacific Ocean, its territory is much greater, inasmuch as a very large portion of the surface of the earth is comprised in the basins of the rivers emptying into it or its gulfs, and into the inland seas connected with it, as, for instance, the Mediterranean Sea, Black Sea, Sea of Asov, North and Baltic Seas, Gulf of Mexico, Caribbean Sea, etc. This points out the fact that the extensive continental plains are not separated from the Atlantic Ocean by mountain-ranges, and are, accordingly, open to the action of the winds blowing from there. Nor are the territories of the Caspian and Aral Seas separated from this ocean by mountains.

The chart of the Atlantic Ocean by the "Deutsche Seewarte" (German Maritime Institute) clearly shows that the temperature at the bottom of the ocean is very low. This is especially the case in the western part of the ocean, where, upon the whole, a temperature of less than  $2^{\circ}$  prevails, whilst that of the eastern part ranges between  $2^{\circ}$  and  $3^{\circ}$ .

But this region of higher temperature divides into two distinct sections, so that between  $10^{\circ}$  and  $15^{\circ}$  north latitude a broad, continuous belt of lower temperature extends in an easterly direction as far as the Cape Verde Islands, and thence, in a narrower strip, towards N. N. E. up to the Strait of Gibraltar. The South Atlantic Ocean, also, has no extensive areas in which the temperature at the bottom is higher than  $3^{\circ}$ , if, therefore, any mention of a high temperature is made, it must be regarded as of a purely relative meaning. Only west of the shores of Europe, between  $38^{\circ}$  and  $60^{\circ}$  north latitude, do we find a moderately large area, with a temperature at the bottom of more than  $3^{\circ}$ , but the depths are there already inconsiderable. In the western part of the ocean, where the temperature is altogether lower, a greater diversity obtains in the temperatures at the bottom. East of South America there is a large area with a temperature below  $0^{\circ}$ ; under  $42^{\circ}$  south latitude it occupies 30 degrees in longitude, viz.: from  $26^{\circ}$  to  $56^{\circ}$  west longitude, and extends northward to  $34^{\circ}$  south latitude. A noteworthy belt of very low temperature (below  $.5^{\circ}$ ) is found farther north between  $2^{\circ}$  and  $26^{\circ}$  south latitude under about  $30^{\circ}$  west longitude. In its most northerly portion, the Island of Fernando Noronha, the temperature is even below zero. Due north thereof, however, a higher temperature prevails, *i. e.* above  $2^{\circ}$ , and in the centre ( $4\frac{1}{2}^{\circ}$  to  $6\frac{1}{2}^{\circ}$  N. latitude and  $24^{\circ}$  to  $29^{\circ}$  W. longitude), the temperature is even higher than  $3\frac{1}{2}^{\circ}$ . The water of the Gulf of Mexico and the Caribbean Sea, and of a part of the Atlantic Ocean east of them and extending north to Cape Hatteras and east to the meridian of Puerto Rico, has likewise a temperature exceeding  $2^{\circ}$ .

The charts of the temperatures at the greatest depth, which existed already in former years, cannot furnish the

same data as those supplied by the charts of medium depths, for the reason that the heaviest and coldest water naturally accumulates where the depth is greatest, provided only that there is a sufficiently deep connection with the reservoirs of cold water, to wit: the Arctic and, especially, the Antarctic Ocean. But the Atlas of the Atlantic Ocean above referred to contains also a map of the temperatures at depths ranging from 800 to 1200 m. A glance at this map shows how greatly the temperatures at that depth increases from  $35^{\circ}$  S. latitude to  $35^{\circ}$  N. latitude.

The course of the isotherms is therefore more uniform in medium depths than at the bottom, principally because of the approximate equality of the former. I shall not describe the course of the isotherms *in extenso*, but confine myself to the remark that the isotherms of  $3^{\circ}$ ,  $4^{\circ}$  and  $5^{\circ}$  draw nearer to the north on the shores of South Africa and, especially, of South America. In the latter case the influence of the rotation of the earth is distinctly noticeable in this that it causes the motion of the water from the south, *i. e.*, from the Southern Ocean, to change to S. E. In mid-ocean, especially from  $0^{\circ}$  to  $10^{\circ}$  west longitude, the isotherms move farther south, *i. e.*, the water at this depth is warmer. The farther we advance northward, at least up to  $35^{\circ}$  N. latitude, the higher is the temperature of the water at this depth. The isotherm of  $8^{\circ}$  corresponds with the warmest water in the western part of the ocean; in the eastern part, it divides into two branches and comprises a very extensive area; between these two branches, on the shores of France, of the Pyrenean Peninsula, and of Morocco, and west of them, water of a yet much higher temperature is found at this depth, so that the isotherms of  $9^{\circ}$ ,  $10^{\circ}$  and  $11^{\circ}$  can be drawn. The isotherms of  $7^{\circ}$  has likewise a northern and a southern branch, and the zone

between them, which, near the American shores, has a width of less than  $4\frac{1}{2}^{\circ}$  ( $29^{\circ}$  to  $33\frac{1}{2}^{\circ}$  north latitude), widens near the Azores to the extent of  $12^{\circ}$  ( $28^{\circ}$  to  $40^{\circ}$  north latitude), and attains between  $10^{\circ}$  and  $13^{\circ}$  west longitude, a width of  $27^{\circ}$  ( $26^{\circ}$  to  $53^{\circ}$  north latitude). The course of the isotherms at depths from 800 to 1200 meters conveys an idea of the insignificant extent to which the cooling of the lower strata of oceans, especially the tropical ones, is influenced by the Northern Ocean and in how marked a degree this is dependent upon the Southern Ocean. The Northern Polar Sea has probably supplied the cold water filling the deeper basins of the North Atlantic; yet, the latter has nowhere temperatures below zero, whilst in the South Atlantic there exists a broad zone, extending from  $34^{\circ}$  to  $43^{\circ}$  south latitude, with a temperature at the bottom of less than  $0^{\circ}$ . Still slighter is the influence of the Arctic Ocean upon the refrigeration of the strata between 800 and 1200 m., even under  $40^{\circ}$  north latitude, which conclusively proves that even as far north as the Tropic of Cancer the colder water comes from the south, and that the section of the Atlantic Ocean bounded by  $30^{\circ}$  and  $40^{\circ}$  north latitude has a much higher temperature than the latitudes near the equator.

It has long been an established fact that under the equator the depth of the stratum of warm water is much less than in the middle latitudes of the North Atlantic Ocean. I refer only to the—in their time—eminent observations of E. Lenz. But the false conclusion has not infrequently been drawn from these observations that the limited depth of the stratum of warm water under the equator points to an upward movement of the water, or, in other words, that the low temperature of the middle strata under the equator is referable to the rising of cold water from the bottom. Were this so, the temperature of the water at the same

depth would necessarily increase south of the equator. The chart, however, clearly shows that, upon the whole, nothing of the kind obtains and that the cold water, down to a temperature of  $4^{\circ}$  and less, which is found under the equator at a depth of 1000 m., flows into these parts from the Arctic Ocean, inasmuch as everywhere in the Atlantic Ocean, between  $30^{\circ}$  N. and  $40^{\circ}$  S. latitude, the temperature of the water at the same depth and under the same meridian, becomes lower the farther we advance to the south.

The steady rise of the temperature from the middle latitudes of the Southern Hemisphere to the equator, and from the equator to the middle latitudes of the Northern Hemisphere, can be accounted for mainly by the corresponding increase in the distance from the fountain-head of cold water.

I return to the high temperature (above  $10^{\circ}$ ) found at the depth of 1000 m. along the coasts of Portugal, Spain, and Morocco. The influence of the Gulf Stream and its branches offer no satisfactory explanation for this temperature, for even on the coasts of Florida, where it is most powerful, do the warm waters not descend to such depths. It seems to me that the warm water comes from the Mediterranean Sea. Through the Strait of Gibraltar an upper current of less salt water passes from the Ocean into the Mediterranean, whilst an under current of saltier water flows in an opposite direction. It is known, however, that the water of the Mediterranean, down to its bottom, is warmer than  $12^{\circ}$ . It is this warm water which produces the high temperature in the Atlantic Ocean at medium depths in the vicinity of the Strait of Gibraltar. To the bottom its influence does not reach. Down there the water is much colder.



If my hypothesis as to the cause of the high temperature in medium depths be correct here, we must expect a high temperature to prevail also in the Indian Ocean in the vicinity of the Red Sea, for this sea, too, has much saltier water than the oceans, and its water is warm down to the lowest strata, so that in its southern part a temperature of  $21.4^{\circ}$  has been found at its bottom, 1240 m. deep. And in fact, there does exist here an upper current from the Indian Ocean, and an under current from the Red Sea.

The temperatures of the Indian Ocean are as follows :

|                 | Between Aden and<br>the Khurian Murian<br>Islands. | Between<br>Khurian Murian<br>and Bombay. |
|-----------------|--|--|
| Surface.....    | 24.7   | 23.9                                     |
| 366 Meters..... | 15.8   | 16.6                                     |
| 549    ".....   | 14.1   | 14.                                      |
| 914    ".....   | 12.3   | 10.5                                     |
| 1280   ".....   | 10.6   | 7.8                                      |
| 2012   ".....   | 6.1  | 5.1                                      |
| 2377   ".....   | 2.2  | 3.3                                      |

Thus no substantial difference exists down to the depth of over 500 m., but from that depth downward, the temperature is decidedly higher in the west, near the Red Sea. Such a high temperature at depths of about 1000 m. has been found here only and in the Atlantic Ocean in the proximity of the Mediterranean Sea, and it may safely be assumed that it is found nowhere else.

The principal current of the Atlantic Ocean is the equatorial one, which moves from east to west under the action of the trade-winds. Accordingly, it is somewhat stronger north than south of the equator, owing to the greater force

and regularity of the southern trade-winds. On striking the eastern part of South America, this current divides into two branches, to-wit: To the left, the Brazilian Current flowing along the coast of South America to about  $45^{\circ}$  south latitude, and to the right, the so-called Gulf Stream, flowing successively along the north coast of South America, through the Caribbean Sea, the Mexican Gulf and finally, in a northerly direction, along the east coast of the United States. Until very recently it was the accepted opinion that all the warm water of the Atlantic Ocean follows this course; but the investigations of Challenger established the existence, to the east of the West Indies, of a large mass of warm water, which undoubtedly contributes to the augmentation of the warm waters flowing in middle latitudes, under the action of the west winds, towards the coasts of Europe. In the proximity of the latter, the southern part of this current is caused by the northwest winds predominating at the northern limit of the trade-winds to flow, as "Rennelstream," along the coast of Africa, finally rejoining the circuit of the Equatorial Current. The northern part of the Gulf Stream is by the predominating southwest winds directed towards the coasts of Great Britain and Norway.

This current, though slow, exerts, nevertheless, a great influence upon the climates of Western and Northern Europe, giving the latter a higher temperature of the year and, particularly, of the winter than is found anywhere else on the earth under the same latitudes. Hence, in Norway, for instance, the temperature of January remains above zero up to the Polar Circle, and no ice is to be found in the vicinity, and north of that country, up to  $75^{\circ}$  north latitude.

North of the North American Continent there are two

polar currents. The Labrador Current, the more powerful of the two, passes through Davis Strait and flows along the coasts of Labrador and Newfoundland; the other courses between Iceland and Greenland, though nearer to the latter. In the middle latitudes of the Southern Hemisphere there is found a movement of water from the west, brought about by the action of the predominating west winds. In the vicinity of the Cape of Good Hope, this current joins another coming from the higher latitudes of the Southern Hemisphere, after which they flow united along the west coast of Africa, finally entering into the circuit of the Equatorial Current.

The temperatures of the water's surface vary but little in the course of the year, much less, at all events, than the air-temperatures, so that north of the equator up to  $35^{\circ}$  north latitude near the American Continent, and up to about  $45^{\circ}$  north latitude in the eastern parts of the ocean, the difference between the coldest and the warmest months amounts to no more than  $5^{\circ}$ . On the Southern Hemisphere the difference is everywhere less than  $5^{\circ}$ .

Regarding the temperature of the surface of the water, the following points are to be noted as of chief interest: In lower latitudes, to wit, between  $40^{\circ}$  north and  $40^{\circ}$  south latitude, the temperature is, upon the whole, lower in the east than in the west of the ocean, which is to say, that the latter is colder near the coasts of Europe and Africa than near those of North and South America. Thus, a temperature of more than  $26^{\circ}$  is found along the coast of South America to  $15^{\circ}$  south latitude, but along the coasts of Africa, only to  $8^{\circ}$  south latitude. The same temperature reaches in the neighborhood of Florida as far as  $30^{\circ}$  north latitude, and in the eastern part of the ocean no farther

than  $11\frac{1}{2}^{\circ}$  north latitude. A temperature of  $22^{\circ}$ , which is found near the coasts of Brazil as far as  $28^{\circ}$  south latitude, extends near St. Helena only to  $15^{\circ}$  south latitude. The cause of this difference lies in the different temperatures of the currents flowing, respectively, towards the eastern and western parts of the ocean in these latitudes, the latter receiving warm currents, and the former cool ones. Under about  $40^{\circ}$  latitude the course of the isotherms changes, the temperature decreasing rapidly in the western part of the ocean, so that no higher than  $45^{\circ}$  north latitude, it is much lower on the American than on the European coasts. The isotherms extend fan-like from west to east; a temperature of  $24^{\circ}$ , for instance, is found in the western part of the ocean under  $31\frac{1}{2}^{\circ}$  north latitude, and in the eastern part, under  $17^{\circ}$  north latitude; a temperature of  $4^{\circ}$ , which prevails in the western part under  $47\frac{1}{2}^{\circ}$  north latitude, is found in the eastern part under  $70^{\circ}$  north latitude; the decrease in the temperature is, therefore, equal to  $1.2^{\circ}$  per degree of latitude in the western part of the ocean, and to  $.38^{\circ}$  in the eastern part. On the Southern Hemisphere, the temperature of the surface is, in the main, lower than on the Northern, the difference increasing with the latitude. Under  $10^{\circ}$  south latitude we find a temperature of about  $24^{\circ}$  in the eastern part, and somewhat more than  $26^{\circ}$  in the western part of the ocean, whereas under  $10^{\circ}$  north latitude it is everywhere above  $26^{\circ}$ ; under  $30^{\circ}$  south latitude the temperature is about  $18^{\circ}$  in the eastern part, and slightly above  $20^{\circ}$  in the western part; under  $30^{\circ}$  north latitude, on the other hand, less than  $20^{\circ}$  is found only on a limited area in the neighborhood of the Canary Islands, whilst throughout the western half of the ocean the temperature exceeds  $22^{\circ}$ , and on the coasts of Florida it is even higher than  $26^{\circ}$ . Under  $50^{\circ}$  south

latitude, a temperature of about  $4^{\circ}$  prevails in the eastern part of the ocean, and only west of  $30^{\circ}$  west longitude does it rise above  $6^{\circ}$ , but nowhere above  $7^{\circ}$ ; but under  $50^{\circ}$  north latitude, the temperature in the eastern part of the ocean is everywhere higher than  $12^{\circ}$ , less than  $6^{\circ}$  being found only between  $46\frac{1}{2}^{\circ}$  west longitude and the American coasts.

The following table exhibits the mean temperatures as computed by me after the Atlas of the Atlantic Ocean, from five to fifty-five degrees of latitude :

| Degree of Latitude | North. Hemisphere. | South. Hemisphere. | Difference. |
|--------------------|--------------------|--------------------|-------------|
| 55                 | 7.7                |                    |             |
| 50                 | 10.3               | 5.5                | 4.8         |
| 45                 | 12.9               | 9.8                | 3.1         |
| 40                 | 17.1               | 13.2               | 3.9         |
| 35                 | 19.7               | 16.9               | 2.8         |
| 30                 | 22.9               | 19.4               | 3.5         |
| 25                 | 24.7               | 20.7               | 4.0         |
| 20                 | 25.3               | 22.7               | 2.6         |
| 15                 | 25.8               | 23.5               | 2.3         |
| 10                 | 26.7               | 24.7               | 2.0         |
| 5                  | 27.4               | 25.8               | 1.6         |
| 0                  | 26.0               |                    |             |

This table shows that not only is the Northern Hemisphere warmer under the same latitudes, but that  $5^{\circ}$  north latitude has a higher temperature than the equator. Latitude  $5^{\circ}$  north may be regarded as the meteorological equator of the Atlantic Ocean. Here is found the highest temperature in the annual mean, as also the region of calms and of variable winds between the two trade-winds. This location of the meteorological equator explains, furthermore, the high temperature of the surface of the water on the Northern Hemisphere. The southeast trade-wind, which blows over a wider area than that from the north-east, puts in motion larger quantities of water, carrying part



thereof to the Northern Hemisphere. From  $35^{\circ}$  north latitude northward, the North Atlantic is considerably narrower than the South Atlantic. Between  $0^{\circ}$  and  $35^{\circ}$  latitude, both north and south, the width of the ocean is nearly equal, so that a larger quantity of warm water is brought into the smaller space of the ocean in middle north latitudes. Moreover, the deflection of the wind from the normal to the isobare is greater in the region of the north-east trade-wind than in that of the south-east one, because of the greater distance of the former from the equator. The middle of the north-east trade-wind in the Atlantic Ocean may be assumed to have its location between  $17^{\circ}$  and  $18^{\circ}$  north latitude, and that of the south-east trade-wind between  $10^{\circ}$  and  $12^{\circ}$  south latitude. In the region of the trade-winds the friction-coefficient is very small, viz., about .0002, and the deflection from the normal to the isobares must, therefore, be as follows: Under  $10^{\circ}=52.7^{\circ}$ , under  $15^{\circ}=62.1^{\circ}$ , under  $20^{\circ}=68.2^{\circ}$ , so that the deflection in the region of the north-east trade-wind is greater by about  $10^{\circ}$  than in that of the south-east trade-wind.

The north-east trade-wind crosses the equator only during the period from February to April, and this only in the western part of the ocean; but the south-east trade-wind passes to the other side of the equator in every month of the year, advancing to  $6^{\circ}$  north latitude. This smaller deflection from the normal to the isobare explains in itself the greater force of the south-east trade-wind, but in addition to this, the southern region of the trade-wind is broader, and the south-east trade-wind more regular. On an extensive area of the sea near the Island of Ascension, no other wind ever occurs than south-east, whilst other than north-east winds occasionally

blow everywhere in the region of the north-east trade-wind.

In the middle region of the trade-winds, the mean direction of the wind is no abstraction, because of the magnitude of the results.

| Degree of Lat.  | Degree of Long. | June to Aug.         |    | Dec. to Feb.         |    |
|-----------------|-----------------|----------------------|----|----------------------|----|
|                 |                 | Mean Wind-direction. | R. | Mean Wind-direction. | R. |
| 15-20 N } ..... | 45-50 .....     | N. 60 E.             | 77 | N. 64 E.             | 71 |
| 10-15 N } ..... | W. ....         | N. 55 E.             | 90 | N. 49 E.             | 86 |
| 5-10 N } .....  | 30-35 .....     | S. 49 E.             | 5  | N. 65 E.             | 30 |
| 0- 5 N } .....  | W. ....         | S. 62 E.             | 70 | N. 87 E.             | 69 |
| 0- 5 S .....    | 20-25 W.....    | S. 43 E.             | 92 | S. 35 E.             | 89 |
| 5-10 S } .....  | 15-20 .....     | S. 47 E.             | 96 | S. 45 E.             | 96 |
| 10-15 S } ..... | W. ....         | S. 48 E.             | 92 | S. 84 E.             | 98 |
| 15-20 S.....    | 0-12½ E.....    | S. 26 E.             | 84 | S. 35 E.             | 96 |

From the extent of the results (R), as set forth in this table, it is evident that the S. E. trade-wind blows with greater regularity than the N. E. one. The former reaches in our summer far beyond the equator, and has decided sway between 0° and 5° north latitude.

Middle polar limits of the N. E. trade-wind.

| Degree of W.<br>Long. | Jan.-March.<br>Degr. N. | Apr.-June.<br>Degr. N. | July-Sept.<br>Degr. N. | Oct.-Dec.<br>Degr. N. |
|-----------------------|-------------------------|------------------------|------------------------|-----------------------|
| 65                    | 26½                     | 28                     | 27                     | 26                    |
| 60                    | 25                      | 24½                    | 27                     | 24                    |
| 55                    | 23½                     | 23                     | 26½                    | 23½                   |
| 50                    | 23                      | 25                     | 26                     | 22                    |
| 45                    | 24½                     | 27                     | 26½                    | 22½                   |
| 40                    | 26                      | 28                     | 27½                    | 24½                   |
| 35                    | 26½                     | 28                     | 27½                    | 25½                   |
| 30                    | 25½                     | 28                     | 28½                    | 26½                   |
| 25                    | 25½                     | 28½                    | 31                     | 26½                   |
| 20                    | 28½                     | 32                     | 31½                    | 29½                   |
| 17                    | 30                      | 33                     | 32½                    | 31                    |

Middle interior (equatorial) limits of the two trade-winds.

|            |         | Degree of West Longitude. |       |       |       |       |      |
|------------|---------|---------------------------|-------|-------|-------|-------|------|
|            |         | 40                        | 35    | 30    | 25    | 20    | 17   |
| Jan.-Feb.  | { N. E. | 3 N.                      | 1½ N. | 20N.  | 4½ N. | 6½ N. | 8 N. |
|            | { S. E. | 1                         | ½     | 1     | 2     | 3     | 3    |
| Mar.-Apr.  | { N. E. | 1½                        | 0     | ½     | 2½    | 5     | 6    |
|            | { S. E. | 1 S.                      | ½ S.  | 1 S.  | ½     | ½     | 1    |
| May-June.  | { N. E. | 3½ N.                     | 3 N.  | 3½ N. | 5½    | 8½    | x    |
|            | { S. E. | ½                         | 0     | 2     | 3     | 3½    | x    |
| July-Aug.  | { N. E. | 8½                        | 9     | 10    | 12    | 14    | x    |
|            | { S. E. | 4                         | 4     | 3     | 3     | 3     | x    |
| Sept.-Oct. | { N. E. | 11½                       | 12    | 11½   | 11    | 12    | x    |
|            | { S. E. | 6                         | 4     | 2     | 2     | 0     | x    |
| Nov.-Dec.  | { N. E. | 6                         | 6     | 6     | 6½    | 9½    | x    |
|            | { S. E. | 4½                        | 4     | 3½    | 3½    | 4     | x    |

x The interior limits lie from May till November on the Continent of Africa.

Middle polar (south) limits of south-east trade-wind.

| Deg. Long. | January-March.<br>Degrees S. | April-June.<br>Degrees S. | July-September.<br>Degrees S. | Oct.-Dec.<br>Degrees S. |
|------------|------------------------------|---------------------------|-------------------------------|-------------------------|
| 30 W.      | 19                           | 21½                       | 20½                           | 16½                     |
| 25 W.      | 21                           | 23½                       | 22½                           | 18½                     |
| 20 W.      | 24                           | 24                        | 24                            | 20½                     |
| 15 W.      | 26½                          | 25                        | 24½                           | 21                      |
| 10 W.      | 28                           | 25                        | 27½                           | 22½                     |
| 5 W.       | 29                           | 27                        | 28½                           | 28                      |
| 0 E.       | 30                           | 28½                       | 29½                           | 28½                     |
| 5 E.       | 31½                          | 32                        | 29½                           | 29                      |
| 10 E.      | 32½                          | 33½                       | 30½                           | 30                      |
| 15 E.      | 33                           |                           |                               |                         |

The region between the interior limits of the trade-winds or, in other words, the region of variable winds and calms near the equator, is, upon the whole, wider in the eastern than in the western part of the ocean, and from July till September, than from January till March. Under 35° west longitude it extends in March over no more than 1½°, whereas under 20° west longitude it has in July a width of

10°. A region of predominating west winds is found in our summer between the two trade-winds, west of Africa. This explains the great extent to which the interior limits recede from one another in that season.

North of the north-east trade-wind a rather extensive belt exists with predominating north winds which, however, are not sufficiently regular to be designated as trade-winds. This region is particularly developed near the coasts of Europe and Africa. In summer, the winds are here north-west, owing to the low atmospheric pressure in the interior of the African Continent, and to the high pressure in the vicinity of the Azores.

In the western part of the ocean the summer winds are south-east, because of the low atmospheric pressure in the interior of North America.

South of the region of the south-east trade-wind, are also south winds prevalent but these, too, have no more the regularity of trade-winds.

From the maps of the atmospheric pressure it may be seen that the latter is highest at the polar limit of the trade-winds, and that it diminishes from there both to the north and to the south. This high atmospheric pressure in middle latitudes is the normal distribution on the oceans, but it is partly modified by the influence of the continents. A comparison of the maps for January and July shows that during the summer of either hemisphere this region of high atmospheric pressure approaches the poles, and during the winter, the equator. This is evident, also, from the polar limits of the trade-winds, especially in the eastern part of the ocean. In the annual mean, the highest atmospheric pressure is found near the Azores. This high atmospheric pressure requires no special explanation for the winter season, when it is the common feature of the

whole section lying between  $30^{\circ}$  and  $40^{\circ}$  north latitude. In summer, however, it is accounted for by the temperature being lower here than on the African Continent, whereby the air in great heights is caused to flow off from Africa to the Azores. On the Southern Hemisphere, the continents, (with the exception of South America, the conditions of which have already been referred to as peculiar to itself), are so little expanded as to render impossible such a considerable heating, and such a flow of air in great heights from the interior of the continents to the oceans, as found on the Northern Hemisphere. For this reason we find nowhere on the South Atlantic Ocean, neither in the annual mean nor, more especially, in summer, so high an atmospheric pressure as near the Azores.

Our knowledge of the climates of the tropical portions of the Atlantic Ocean has been greatly advanced through two publications of the London "Meteorological Office." (Meteorology of square 3 ( $0^{\circ}$ - $10^{\circ}$  N.) and "Chart of Meteorological Data for Nine Ten-degree Squares"). These detailed communications have, in the main, confirmed the hypotheses brought forward by me in 1872, while at the same time throwing much new light upon the conditions under consideration. More especially do these investigations establish the fact that  $5^{\circ}$  north latitude is the real meteorological equator of the Ocean. South thereof we already find the heaviest cloudiness in the summer of the Southern Hemisphere; as, for instance,

| Latitude.                         | Largest Cloudiness. | Smallest Cloudiness. |
|-----------------------------------|---------------------|----------------------|
| $0^{\circ}$ - $5^{\circ}$ N.....  | 66 (January).       | 43 (August).         |
| $5^{\circ}$ - $10^{\circ}$ N..... | 68 (July).          | 44 (April).          |

The air-temperature between  $0^{\circ}$  and  $5^{\circ}$  north latitude is



also higher from December till March (highest,  $26.9^{\circ}$ , in March), although it is in these very months that the cloudiness is heavier, and the rains more frequent and copious, whilst July and August, when rains are rare and the cloudiness light, have, nevertheless, a lower temperature, to wit:  $25^{\circ}$  in August.

In 1880 appeared Kœppen and Sprung's important work on the rain-conditions of the Atlantic Ocean. It is worked out on the basis of observations of German and Dutch vessels, elaborated at the "Deutsche Seewarte." It contains, however, an elaboration not only of the observations of the tropical, but also of the extra-tropical latitudes of the Atlantic Ocean. It is based, throughout, on rain-probabilities. On the ocean we must content ourselves with this, because of the absolute lack of rain-measurements. This much is certain, that a rainy day yields more water near the equator than in middle latitudes. Still smaller, no doubt, is the quantity of rain falling on a rainy day in the region of the trade-winds. While rains are not exactly rare in some parts of this region, they are, at all events, of brief duration and scant in quantity. It is to be hoped that, ere long, we may obtain through naval observations information regarding the number of rain-hours, which will convey a clearer conception of the phenomena than the number of rainy days.

Between  $15^{\circ}$  north and  $5^{\circ}$  south latitude abundant rain-falls occur on the Atlantic Ocean during and after the transit of the sun through the zenith of the respective localities. Between  $0^{\circ}$  and  $5^{\circ}$  north latitude, the rainy season occurs, as already observed, in the winter and spring of the Northern Hemisphere, and between  $5^{\circ}$  and  $15^{\circ}$ , in the summer and autumn thereof. The rain-probability is as follows :

| Latitude.   | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|-------------|------|------|------|-------|-----|------|------|------|-------|------|------|------|
| 5°-15° N.   | 19   | 9    | 14   | 2     | 28  | 50   | 65   | 60   | 54    | 63   | 44   | 34   |
| 5° N.-5° S. | 52   | 62   | 62   | 70    | 62  | 42   | 18   | 12   | 24    | 32   | 32   | 46   |

The region between 15° and 20° north latitude is marked by a great deficiency of rains, which is owing to the great regularity of the trade-wind prevailing there. From February to June scarcely any rain is precipitated here, most of the rain falling in August, September, and at the beginning of winter.

North of 20° north latitude, autumn and winter rains predominate everywhere, whilst the summer months, are upon the whole, dryer. Between 20° and 40° north latitude, the winter is altogether moderately rainy, whilst the summer is dry. North of 40° north latitude, rains are frequent in every month, and in winter and autumn, three of every four, aye, four of every five days, are rainy. On the Southern Hemisphere between 5° and 50° south latitude, there is also more rain in the colder than in the warmer months. Between 40° and 50° south latitude a greater difference between the seasons is recognizable than between 20° and 40° south latitude, which is the very opposite of what is observed in corresponding latitudes of the Northern Hemisphere. A still greater difference between the two hemispheres is exhibited between latitudes 5° and 20°, inasmuch as the summer is the driest season between 5° and 30° south. This probably arises from the almost exclusive sway of the trade-wind even in summer, that wind being on the high sea a decidedly dry wind. The somewhat frequent rains in the colder months may possibly find their explanation in the fact that at that time the air is colder than the surface of the sea, which naturally facilitates condensation.

The rain-probability is here as follows :

| Degrees of Latitude. | Degrees of Longitude W. | Rainiest Months. |    | Driest Months. |    |
|----------------------|-------------------------|------------------|----|----------------|----|
| 20—40 N. {           | 10—30                   | February,        | 48 | June,          | 10 |
|                      | 30—50                   | December,        | 52 | August,        | 17 |
|                      | 30—50                   | { November,      | 53 | August,        | 20 |
| 40—55 N.             | 0—30                    | { Oct., Dec.,    | 50 | July,          | 27 |
|                      |                         | { January,       | 77 | June,          | 37 |
|                      |                         | { December,      | 73 | August,        | 45 |
| 40—50 N.             | 30—50                   | { March,         | 83 | September,     | 46 |
|                      |                         | { February,      | 80 | August, July,  | 56 |
|                      |                         | { April,         | 43 | December,      | 20 |
| 5—20 S.              | 0—30                    | { September,     | 37 | January,       | 22 |
|                      |                         | { April,         | 56 | January,       | 35 |
|                      |                         | { October,       | 56 | February,      | 37 |
| 20—40 S.             | 0—50                    | { June,          | 90 | February,      | 27 |
|                      |                         | { November,      | 71 | March,         | 33 |
|                      |                         |                  |    |                |    |

The English observations are prepared after a different plan. They present the frequency of rains in per cent. of the number of observations, and not of the number of days, so that, under otherwise equal conditions, the figures arrived at by them must be much less than those yielded by the customary method of computation.

From the following table (Page 270) it may be seen that in the immediate vicinity of the equator the rainy season continues for six months, and, furthermore, that no rain whatever has been observed there during the three months, June, July, August. The actual conditions, therefore, are completely at variance with the current notions concerning the rains in these latitudes in all the months of the year. Already between  $4^{\circ}$  and  $5^{\circ}$  north latitude, but more especially south of  $4^{\circ}$ , the type of the Southern Hemisphere predominates, *i. e.*, the months from January till March are the rainiest of the year, whilst during the summer of the Northern Hemisphere the rains are exceedingly limited. The section from  $4^{\circ}$  to  $7^{\circ}$  north latitude is a region of transition, where the rainy season is divided into two

periods, one of which extends from July till August, the other, from October till November.

Hitherto I have considered the rain-probability. For some islands of the ocean, however, we have also rain-measurements, the most interesting of which are those on small islands, because of the strictly oceanic character of their conditions. On the Island of St. Helena the rain quantities are very small, amounting to only 13 cm. on the sea-shore, and are rather unevenly distributed over the months; whilst at Longwood, at an elevation of more than 500 m., the rainfalls equal 105 cm. On the Island of Ascension, under  $8^{\circ}$  south latitude, the annual rainfall does not exceed 8 cm., the greater part of which is precipitated in April and July. These observations confirm my opinion as to the great rain-deficiency of those regions of the Ocean where the trade-winds blow with great constancy. On the Island of St. Thomas, near the African coast, under  $\frac{1}{2}^{\circ}$  north latitude, the annual rainfall amounts to 107 cm.; but July has no rain whatever, and the four months from June till September, have but four per cent. of the annual fall, which shows that here, virtually under the equator, the rainy and the dry season are distinctly separate from one another.

Altogether, it must be remarked with regard to the rain conditions of the Atlantic Ocean, and especially of the tropics: 1. These conditions are more complicated than has generally been assumed; 2. The rain periods of the Ocean are, in part, essentially different from those of the contiguous continents; 3. Many observations must yet be made before our knowledge of the conditions will be somewhat adequate.

| Degree of Latitude. | Rainy Months.<br>(More than 20 per cent.) | Dry Months.<br>(Less than 5 p.c.) | Rainiest Months.  | Driest Months.        |
|---------------------|---|-----------------------------------|-------------------|-----------------------|
| 10—9 N.             | July till October.                        | Jan. till May.                    | August, 27        | Feb. till Apl, 0      |
| 9—8                 | June till October.                        | Jan. till May.                    | July and Aug., 28 | Jan. till Ap'l, 0     |
| 8—7                 | { June, July, Aug.,<br>gust, Oct., Nov. } | Feb. till April.                  | July, 31          | Feb. till Mar., 0     |
| 7—6                 | { June, July, Oct.,<br>Nov. }             | Feb. till April,                  | June, 31          | Mar., April, 1        |
| 6—5                 | { May, June, Oct.,<br>Nov. }              | February.                         | June and Oct., 26 | February, 3           |
| 5—4                 | { Jan., May, June<br>Oct., Nov. }         | August.                           | May, 30           | August, 2             |
| 4—3                 | { Jan., Feb., Ap'l,<br>May. }             | August.                           | January, 32       | August, $\frac{3}{4}$ |
| 3—2                 | January till May.                         | July till Sept.                   | Feb., Mar., 26    | August, $\frac{3}{4}$ |
| 2—1                 | Jan., Feb.                                | June till Nov.                    | January, 25       | September, 0          |
| 1—0                 | No month.                                 | June till Nov.                    | January, 19       | June till Aug. 0      |

EXPLANATORY NOTE.—Throughout this translation, the centigrade thermometer and metric measures have been used. The abbreviations are : km.—kilometer, m.—meter, cm.—centimeter, mm.—milometer. In the principal work the temperatures are quoted according to the Fahrenheit scale.

S. K.



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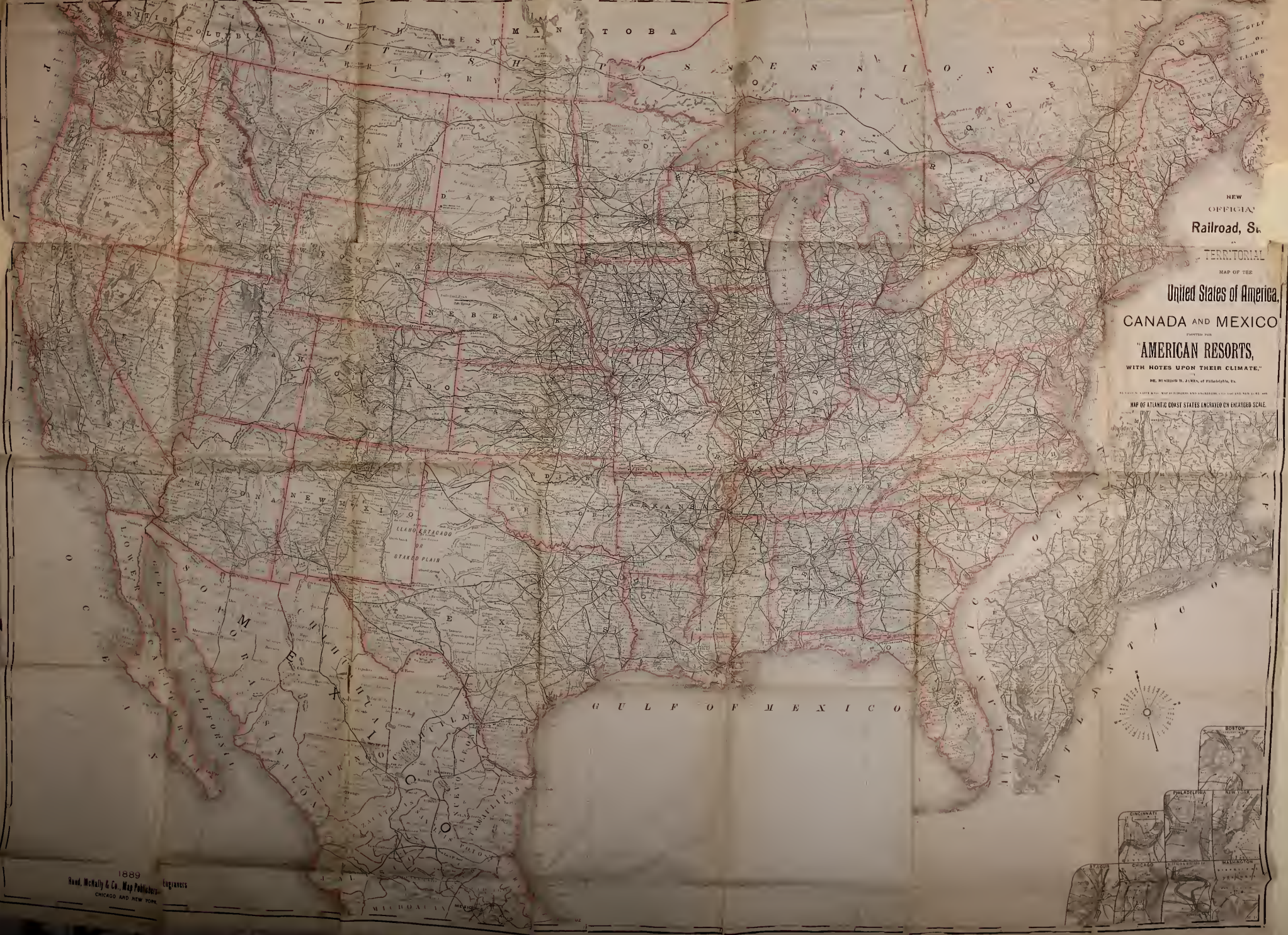


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MAP OF ATLANTIC COAST STATES ENLARGED ON ENLARGED SCALE.

